PART B. BULL TROUT AND PROPOSED BULL TROUT CRITICAL HABITAT

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Consultation Background: In 1998, the U.S. Fish and Wildlife Service (Service) issued the *Biological Opinion for the Effects to Bull Trout from the Continued Implementation of Land and Resource Management Plans and Resource Management Plans as Amended by the Interim Strategies for Managing Fish Producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana and portions of Nevada (INFISH)* and the *Interim Strategy for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho and portions of California (PACFISH*; UDSI 1998d). The 1987 Kootenai National Forest Plan (USDA 1987) was included in the plans addressed in that consultation.

Bull Trout Action Area: The action area for Part B of this biological opinion is the Rock Creek drainage and Cabinet Gorge Reservoir downstream from the Rock Creek confluence to Cabinet Gorge Dam within the Lower Clark Fork River Section 7 Watershed. The Rock Creek drainage would contain all of the proposed action as no action is proposed in the Bull River. The Bull River drainage is excluded from the action area because no impacts are anticipated as a result of the proposed action. Cabinet Gorge Dam is reasoned to be the downstream extent of the action area as the dam would likely block downstream transport of contaminated sediment in the event of a large scale paste pile failure. One bull trout subpopulation (USDI 1998c) is recognized within the action area. Noxon and Cabinet Gorge Dams form the upper and lower bounds, respectively, of the Cabinet Gorge Reservoir bull trout subpopulation.

DESCRIPTION OF PROPOSED ACTION

The proposed Rock Creek Mine would be a 10,000-ton-per-day underground copper and silver mine in northwestern Montana. The mine, mill, and other facilities would occur in Sanders County, about 13 miles northeast of the town of Noxon (Figure 1). The mine originally was proposed by ASARCO Incorporated, but was sold to the Sterling Mining Company in 1999. The Sterling Mining Company is the new project proponent.

The proposed action is Alternative V, the Forest's preferred alternative to the Sterling Mining Company proposed mine plan. The complete description of Alternative V is provided in the FEIS (MDEQ and USDA 2001) and included in this biological opinion as Appendix A. Here we summarize only major features of the proposed action. The proposed action for the mine includes the development of an evaluation adit, a 5.5-year construction period, a 27.5-year operation/production period, and a 2-year reclamation period, for at least a 35-year period (Table B1).

Table B1.
Estimated Implementation Schedule for Sterling Mining Company Rock Creek Mine in Sanders County, Montana

PROJECT YEAR	ACTIVITY
1 - 3	Evaluation adit construction
2 - 3	Mine development[1]
4 - 5.5	Mine development[1]/surface facilities construction[2]
5.5 - 6	Start-up/limited production
7 - 33	Production
34 - 35	Reclamation

[1] Waste rock will be hauled mid-August through May during mine development period.
[2] Includes construction of the mill site, waste water treatment plant, paste plant, and utilities corridor.

Alternative V would result in construction of an evaluation adit, mine, mill, tailings paste facility, rail loadout, reverse osmosis and passive biotreatment facility, and various pipelines and access roads. A "bottom-up" construction option for the paste facility would be used and final design would incorporate measures to meet visual impact mitigation and reclamation goals. Some mine water would be stored in underground workings during mine operation, but most excess water would be treated and discharged to the Clark Fork River.

Several check points are built into the development of the mine to address specific conditions as they develop. For example, initial exploration involves drilling an evaluation adit to further investigate and define the underground ore body. Results of the evaluation adit may result in various scenarios described in Alternative V. Should acid-forming rock be located, certain constraints would be required that will not be implemented if no acid-forming rock is encountered. Several similar check points and contingency plans occur throughout the life of the mine and will not be specifically addressed here.

The Rock Creek Mine's proposed permit boundary would encompass 1,560 acres; 483 acres would directed impacted by mining activity and 1,078 would remain undisturbed. The analysis area includes approximately 3.54 miles of road construction and 5.43 miles of road reconstruction. Land encompassed by the proposed permit boundary is 48 percent private land and 52 percent national forest lands (Table B2).

Table B2. Proposed Surface Disturbance and Features Associated with Rock Creek Mine Project	
PROJECT FEATURE	AREA IN ACRES
Analysis area	198,394
Hard rock mine permit area	1,560**
Total area of surface disturbance	483
Tailings impoundment*	368
Mill site*	41
Exploration adit and support facilities	10
Roads	64
Road construction	3.54 miles
Road reconstruction	5.43 miles
Total road construction/reconstruction	8.97 miles

* Estimated surface disturbance includes all the features associated with the tailings impoundment and mill site.
** Corrected permit area acres from MDEQ, December 2000. From Appendix A, Alternative V description.

The initial analysis for the proposed Rock Creek Mine project predicted construction of the mine would commence in 2000. Therefore, the calendar years identified during the analysis no longer correspond with the actual implementation of the project. The life of the mine may be shorter or longer than predicted, depending on the quality, quantity and accessibility of the ore body, market values of the minerals recovered and other factors that cannot be predicted at this time

STATUS OF THE SPECIES/CRITICAL HABITAT

Species Description

Prior to 1980, bull trout and Dolly Varden (*S. malma* Girard) were combined under one name, the Dolly Varden (*S. malma* Walbaum). In 1980, with the support of the American Fisheries Society, these fish were recognized as two distinct species. Two of the most useful characteristics in separating the two species are the shape and size of the head (Cavender 1978), though correct identification may be difficult. Bull trout have an elongated body, somewhat rounded and slightly compressed laterally, and covered with cycloid scales numbering 190-240 along the lateral line. The mouth is large with the maxilla extending beyond the eye and with well-developed teeth on both jaws and head of the vomer (none on the shaft). Bull trout have 11 dorsal fin rays, 9 anal fin rays, and the caudal fin is slightly forked. Although they are often olive green to brown with paler sides, color is variable with locality and habitat. Their spotting pattern is easily recognizable, showing pale yellow spots on the back, and pale yellow and orange or red spots on the sides with no halos. Bull trout fins are often tinged with yellow or orange, while the pelvic, pectoral, and anal fins have white margins. Bull trout have no black or dark markings on the dorsal fin.

Listing History

In September 1985, bull trout in the coterminous United States were designated as a category 2 candidate for listing, in the Animal Notice of Review (USDI 1997). Category 2 candidates show some evidence of vulnerability but not enough information is available to support a listing of the species (USDI 1997). Their status changed in May 1993 when the Service placed bull trout in category 1 of the candidate species list (USDI 1997). The listing of category 1 species was justified, but precluded due to other higher priority listing actions (USDI 1997).

In June 1998, the Service published the final rule listing the Klamath River and Columbia River distinct population segments (DPS) as threatened (USDI 1998a), with an effective date of July 10, 1998. In November 1999 the Service published a rule listing all populations of bull trout as threatened throughout its entire range in the coterminous United States (USDI 1999), with an effective date of December 1, 1999.

Current Known Range

Bull trout are found throughout the northwestern United States and western Canada (Rieman and McIntyre 1993). In the Klamath River basin, only isolated, resident bull trout are found in higher elevation headwater streams of the Upper Klamath Lake, Sprague River, and Sycan River watersheds (Goetz 1989; Light et al. 1996). The Columbia River basin is composed of 141 bull trout subpopulations residing in parts of Oregon, Washington, Idaho, and Montana (USDI 1998b). Within Montana, bull trout exist in the headwaters of the Saskatchewan River, the Clark Fork and the Kootenai subbasins (USDI 1998b).

Life History

Life History Forms

Two distinct life-history forms, migratory and resident, occur throughout the range of bull trout (Pratt 1992; Rieman and McIntyre 1993). Migratory bull trout rear in natal tributaries for several years before moving to larger rivers (fluvial form), lakes (adfluvial form), or the ocean (anadromous) to mature. Migratory forms return to natal tributaries to spawn (MBTSG 1998). Migratory bull trout may use a wide range of habitats ranging from first to sixth order streams and varying by season and life stage. Resident populations often live in small headwater streams where they spend their entire lives (Thurow 1987; Goetz 1989).

Most bull trout spawning occurs between late August and early November (Pratt 1992; MBTSG 1998). They may spawn each year or in alternate years (Fraley and Shepard 1989). Hatching occurs in winter or early spring, and alevins may stay in the gravel for extended periods, typically emerging from the gravel in April. Growth is variable with different environments, but first spawning is usually noted after age 4, and the fish may live 10 or more years (Pratt 1992; Rieman and McIntyre 1993). Although spawning typically occurs in second to fifth order streams, juveniles may move upstream or downstream of reaches used by adults for spawning, presumably to forage in other accessible waters (Fraley and Shepard 1989; Ratliff 1992). Seasonal movements by adult bull trout may range up to 300 kilometers as migratory fish move from spawning and rearing areas into over-winter habitat in large lakes or rivers in the downstream reaches of large basins (Bjornn and Mallet 1964; Fraley and Shepard 1989).

Habitat Requirements

Common predators of juvenile bull trout are larger bull trout and non-native fish, such as lake trout, brown trout and brook trout (Pratt and Huston 1993; Rieman and McIntyre 1993). Disease is not believed to be a critical factor in the long-term health and survival of bull trout populations (USDI 1999). Hybridization with brook trout poses a threat to the persistence of isolated or remnant populations. These hybrids are likely to be sterile, experience developmental problems and could eliminate a bull trout population (Leary et al. 1993; Rieman and McIntyre 1993).

The degree of hybridization, other interactions, and distribution of the two species is likely influenced by habitat condition (Rieman and McIntyre 1993). Bull trout are rare, if present at all, in many streams supporting large numbers of brook trout (Buckman et al. 1992; Ziller 1992; Rich 1996). Rich (1996) found brook trout occupied more degraded stream reaches than bull trout. Leary et al. (1993) documented a shift in community dominance from bull trout to brook trout in Lolo Creek, Montana, and expect the trend to continue until bull trout are displaced from the stream. Habitat degradation appears to give brook trout a competitive advantage over bull trout.

Bull trout are sensitive to environmental disturbance at all life stages, and have very specific habitat requirements. Bull trout growth, survival, and long-term population persistence appear to be dependent upon five habitat characteristics: temperature, substrate composition, migratory corridors, channel stability and cover (Rieman and McIntyre 1993). Cover includes undercut banks, large woody debris, boulders, and pools that are used as rearing, foraging and resting habitat, and protection from predators (Fraley and Shepard 1989; Watson and Hillman 1997). Deep pools also help moderate stream temperatures, offering refuge from warmer water temperatures during summer low-flow conditions. Stream temperatures and substrate types are especially important to bull trout.

Temperature: Like other char species, bull trout are particularly intolerant of warm water and are typically associated with the coldest stream reaches within basins they inhabit (Craig 2001; Selong et al. 2001). The most heavily populated reaches in several Oregon streams seldom exceed 15°C (Buckman et al. 1992; Ratliff 1992; Ziller 1992). Cold water temperatures are required for successful bull trout spawning. Many studies report water temperatures near 9° or 10°C during the onset of spawning (Riehle et al.1997; Chandler et al. 2001). Bull trout spawning typically occurs in areas influenced by groundwater (Allan 1980; Shepard et al. 1982; Fraley and Shepard 1989; Ratliff 1992). In Montana's Swan River drainage, bull trout spawning site selection occurred primarily in stream reaches directly influenced by groundwater upwelling or directly downstream from upwelling reaches (Baxter et al. 1999; Baxter and Hauer 2000). Cold water upwellings may moderate warmer summer stream temperatures (Bonneau and Scarnecchia 1996; Adams and Bjornn 1997) and extreme winter cold temperatures, which can result in anchor ice.

Cold water temperature also influences the development of embryos and the distribution of juveniles (Fraley and Shepard 1989; Saffel and Scarnecchia 1995; Dunham and Chandler 2001). Selong et al. (2001) report the predicted ultimate upper incipient lethal temperature for age-0 bull trout during 60-day lab trials to be 20.9°C and peak growth to occur at 13.2°C. Goetz (1994) reports juvenile bull trout in the Cascade Mountains were not found in water temperatures above 12°C.

Substrate Composition: Bull trout are more strongly tied to the stream bottom and substrate than other salmonids (Pratt 1992). Substrate composition has been repeatedly correlated with bull trout occurrence and abundance (Rieman and McIntyre 1993; Watson and Hillman 1997; Earle and McKenzie 2001) as well as selection of spawning sites (Graham et al. 1981; Boag and Hvenegaard 1997). Bull trout are more often found in areas with boulder and cobble substrate rather than areas of finer bed material (Watson and Hillman 1997).

Preferred spawning habitat includes low gradient reaches of mountain valley streams with loose, clean gravel and cobble substrate (Fraley and Shepard 1989; Reiser et al. 1997; MBTSG 1998). Fine sediments fill spaces between the gravel needed by incubating eggs and fry, lowering incubation survival and emergence success (Everest et al. 1987). If fine sediment is deposited into interstitial spaces during incubation, it can impede the movement of water through the gravel, lowering the levels of dissolved oxygen as well as inhibiting the removal of metabolic waste (MBTSG 1998). Because bull trout eggs incubate about 7 months (e.g., mid-September to mid-April) in the gravel, they are especially vulnerable to fine sediment accumulation and water quality degradation (Fraley and Shepard 1989). Some embryos can incubate and develop successfully but emerging fry can be trapped by fine sediment and entombed (MBTSG 1998).

Juveniles are similarly affected, as they also live on or within the streambed cobble (Pratt 1984). The accumulation of sediment leads to a reduction in pool depth and interstitial spaces, as well as causing channel braiding or dewatering (Shepard et al. 1984; Everest et al. 1987). Substrate interstices also provide important over wintering cover (Goetz 1994; Jakober 1995). Sub adults and adults tend to occupy deep pools with boulder-rubble substrate and abundant cover (MBTSG 1998).

Migratory Corridors: Migratory bull trout ensure interchange of genetic material between populations, thereby promoting genetic variability. Unfortunately, many populations of migratory bull trout have been restricted or eliminated due to stream habitat alterations, including seasonal or permanent obstructions, detrimental changes in water quality, increased temperatures, and the alteration of natural stream flow patterns. Migratory corridors tie seasonal habitat together for anadromous, adfluvial, and fluvial forms, and allow for dispersal of resident forms for recolonization of recovering habitats (Rieman and McIntyre 1993). Dam and reservoir construction and operation have altered major portions of bull trout habitat throughout the Columbia River Basin. Dams without fish passage create barriers to fluvial and adfluvial bull trout which isolates populations, and dams and reservoirs alter the natural hydrograph, thereby affecting forage, water temperature, and water quality (USDI 1999).

Channel Stability and Stream Flow: Bull trout are exceptionally sensitive to activities that directly or indirectly affect stream channel integrity. Juvenile and adult bull trout frequently inhabit areas of reduced water velocity, such as side channels, stream margins, and pools. These areas can be eliminated or degraded by management activities (Rieman and McIntyre 1993). Bull trout also are sensitive to activities that alter stream flow. Incubation to emergence may take up to 200 days during winter and early spring. The fall spawning period and strong association of juvenile fish with stream channel substrates make bull trout vulnerable to flow pattern changes and associated channel instability (Fraley and Shepard 1989; Pratt 1992; Pratt and Huston 1993; Rieman and McIntyre 1993).

Patterns of stream flow and the frequency of extreme flow events that influence substrate are important factors in population dynamics (Rieman and McIntyre 1993). Embryo and juvenile bull trout, closely associated with the substrate, may be particularly vulnerable to flooding and channel scour associated with rain-on-snow events common in some parts of the range (Rieman and McIntyre 1993). Channel dewatering and bed aggradation also can block access for spawning fish.

Cover: All life history stages of bull trout are associated with complex forms of cover, including large woody debris, undercut banks, boulders and pools (Fraley and Shepard 1989; Goetz 1989). Young-of-the-year bull trout tend to use areas of low velocity such as side channels, staying close to substrate and submerged debris (Rieman and McIntyre 1993). Juveniles live close to undercut banks, coarse rock substrate and woody debris in the channel (Pratt 1984; Goetz 1991; Pratt 1992). Adult fish use deep pools with boulder-rubble substrate, undercut banks and areas with large woody debris (Pratt 1984, 1985; MBTSG 1998). Cover also plays an important role to spawning bull trout by protecting the adults from disturbance or predation as well as providing security (MBTSG 1998). Jakober (1998) observed bull trout over wintering in deep beaver ponds and pools containing large woody debris in the Bitterroot River drainage, and suggested that suitable winter habitat may be more restrictive than summer habitat.

Population Dynamics

Population size

The Columbia River DPS of bull trout has declined in overall range and numbers of fish. Though still widespread, there have been numerous local extirpations reported throughout the Columbia River basin (Thomas 1992; Goetz 1994). The Service recognizes 141 subpopulations within the Columbia River DPS, indicating habitat fragmentation, isolation, and barriers limiting bull trout distribution and migration currently exist within the basin. The Service defined subpopulation as a reproductively isolated group of bull trout that spawns within a particular area of a river system (USDI 1998b). If two groups of bull trout are separated by a barrier (e.g., an impassable dam or waterfall, or reaches of unsuitable habitat) only allowing individuals in the upper portion of the watershed access to downstream portions (i.e., 1-way passage), both groups were considered subpopulations. The ensuing baseline and effects analysis uses the subpopulation as the unit of biological organization to demonstrate the influences of land management activities on population persistence at several scales.

To evaluate the current bull trout distribution and abundance, the Service analyzed data on bull trout relative to subpopulations because fragmentation and barriers have isolated bull trout throughout their current range. In addition, subpopulations were considered at risk of extirpation from naturally occurring events if they were:

1. Unlikely to be reestablished by individuals from another subpopulation (i.e., functionally or geographically isolated from other subpopulations);

2. Limited to a single spawning area (i.e., spatially restricted); and either

3. Characterized by low individual or spawning numbers; or

4. Primarily of a single life-history form.

For example, a subpopulation of resident fish isolated upstream of an impassable waterfall would be considered at risk of extirpation from naturally occurring events especially if the subpopulation had low numbers of fish that spawn in a restricted area. In such cases, a natural event such as a fire or flood affecting the spawning area could eliminate the subpopulation, and the impassable waterfall would prevent reestablishment from fish downstream. However, a subpopulation residing downstream of the waterfall might not be considered at the same level of risk of extirpation from naturally occurring events because there would be immigration potential by fish from the subpopulation upstream. Because resident bull trout may exhibit limited downstream movement, the Service's determination of subpopulations at risk of extirpation from naturally occurring events may overestimate the number of subpopulations likely to be reestablished (USDI 1998b).

In the process of reviewing information relative to the bull trout listing process, the status of subpopulations was based on modified criteria of Rieman et al. (1997), including the abundance, trends in abundance, and the presence of life-history forms of bull trout. The Service considered a subpopulation “strong” if 5,000 individuals or 500 spawners likely occur in the subpopulation, abundance appears stable or increasing, and life-history forms were likely to persist. The Service considers a subpopulation “depressed” if less than 5,000 individuals or 500 spawners likely occur in the subpopulation, abundance appears to be declining, or a life-history form historically present has been lost. If there was insufficient abundance, trend, and life-history information to classify the status of a subpopulation as either “strong” or “depressed,” the status was considered “unknown.” With exceptions in some areas, bull trout generally occur throughout the Columbia River DPS as isolated subpopulations in headwater lakes or tributaries where migration is now restricted (USDI 1999). The complete review of this evaluation is found in a status summary compiled by the Service (USDI 1998c).

Based on abundance, trends in abundance, and the presence of life-history forms, bull trout were considered strong in 13 percent of the occupied range in the interior Columbia River basin (Quigley and Arbelbide 1997). Using various estimates of bull trout range, Rieman et al. (1997) estimated that bull trout populations were strong in 6 percent of the subwatersheds in the Columbia River basin. Bull trout declines have been attributed to the effects of land and water management activities, including forest management and road building, mining, agricultural practices, livestock grazing (Meehan 1991; Frissell 1993), isolation and habitat fragmentation from dams and agricultural diversions (Rode 1990; Jakober 1995), fisheries management practices, poaching and the introduction of non-native species (Rode 1990; Bond 1992; Donald and Alger 1993; Leary et al. 1993; Pratt and Huston 1993; Rieman and McIntyre 1993; MBTSG 1998).

Population Variability

Distribution of existing bull trout populations is often patchy even where numbers are still strong and habitat is in good condition (Rieman and McIntyre 1993,1995). It is unlikely bull trout occupied all of the accessible streams within the range at any one time. The number of bull trout within a population can vary dramatically both spatially and temporally. Redd counts are commonly used to assess population trends. Existing long-term redd count data indicate a high degree of variability within and between populations (Rieman and McIntyre 1996). Habitat preferences or selection is likely important (Rieman and McIntyre 1995; Dambacher and Jones 1997), but more stochastic extirpation and colonization processes may influence distribution even within suitable habitats (Rieman and McIntyre 1995).

Population Stability

The best available information indicates that bull trout are in widespread decline across their historic range and are restricted to numerous reproductively isolated subpopulations in the Columbia River basin with many recent local extirpations (Rieman et al. 1997; USDI 1998b). The largest contiguous areas supporting bull trout are central Idaho and western Montana. Many bull trout subpopulations in the Columbia River DPS are characterized by declining trends.

Status and Distribution

Historic and Current Distribution

The historic range of bull trout was restricted to North America (Cavender 1978; Haas and McPhail 1991). Bull trout have been recorded from the McCloud River in northern California, the Klamath River basin in Oregon and throughout much of interior Oregon, Washington, Idaho, western Montana, and British Columbia, and extending into Hudson Bay and the St. Mary's River in Saskatchewan (Rieman et al. 1997).

Bull trout may be a glacial relict and their broad distribution has probably contracted and expanded periodically with natural climate change (Williams et al. 1997). Genetic variation suggests an extended and evolutionarily important isolation between populations in the Klamath and Malheur basins and those in the Columbia River basin (Leary et al.1993). Populations within the Columbia River basin are more closely allied and are thought to have expanded from common glacial refugia or to have maintained higher levels of gene flow among populations in recent geologic time (Williams et al. 1997).

Despite occurring widely across a major portion of the historic potential range, many areas support only remnant populations of bull trout. Bull trout were reported present in 36 percent and unknown or unclassified in 28 percent of the subwatersheds within the potential historic range. Strong populations were estimated to occur in only 6 percent of the potential historic range (Rieman et al. 1997). Bull trout are now extirpated in California and only remnant populations are found in much of Oregon (Ratliff and Howell 1992). A small population still exists in the headwaters of the Jarbidge River, Nevada, which represents the present southern limit of the species' range.

Though bull trout may move throughout entire river basins seasonally, spawning and juvenile rearing appear to be restricted to the coldest streams or stream reaches. The downstream limits of habitat used by bull trout are strongly associated with gradients in elevation, longitude, and latitude, which likely approximate a gradient in climate across the basin (Goetz 1994). The patterns indicate that spatial and temporal variation in climate may strongly influence habitat available to bull trout. While temperatures are probably suitable throughout much of the northern portion of the range, predicted spawning and rearing habitat are restricted to increasingly isolated high elevation or headwater "islands" toward the south (Goetz 1994; Rieman and McIntyre 1995).

Status of Columbia River Distinct Population Segment: Range wide, populations are generally isolated and remnant. Migratory life histories have been lost or limited throughout the range (Ratliff and Howell 1992; Pratt and Huston 1993; Rieman and McIntyre 1993, 1995; Goetz 1994; Jakober 1995; MBTSG 1998) and fluvial bull trout populations in the upper Columbia River portion of the DPS appear to be nearly extirpated. Resident populations existing in headwater tributary reaches are isolated and generally low in abundance (Thomas 1992).

The Service recognizes 141 subpopulations in the Columbia River DPS within Idaho, Montana, Oregon, and Washington, and additional subpopulations in British Columbia. Bull trout in this DPS are threatened by habitat loss and degradation, passage restrictions at dams, and competition from non-native brook trout (*S. fontinalis*) and lake trout (*S. namaycush*). The American Fisheries Society listed bull trout as a species of concern in all of its range (California, Idaho, Montana, Nevada, Oregon, Washington, Alberta, and British Columbia) except Alaska, because of present or threatened destruction, modification, or curtailment of its habitat or range and introduction of exotic species (Williams et al. 1989). Bull trout have been categorized as an indicator species of forest and ecosystem health as they are particularly sensitive to environmental change (Rieman and McIntyre 1993).

Generally, where status is known and population data exists, bull trout populations throughout the Columbia River DPS are at best stable and more often declining (Thomas 1992; Schill 1992; Pratt and Huston 1993). Presently, bull trout in the Columbia basin occupy about 45 percent of their estimated historic range (Quigley and Arbelbide 1997). Of the 141 subpopulations, 75 are at risk of natural extirpation through physical isolation. Many of the remaining bull trout occur as isolated subpopulations in headwater tributaries, or in tributaries where the migratory corridors have been lost or restricted. Few bull trout subpopulations are considered strong in terms of relative abundance and subpopulation stability (USDI 1998c). Those few remaining strong subpopulations are generally associated with large areas of contiguous habitats such as portions of the Snake River basin in central Idaho, the South Fork Flathead River in Montana, and the Blue Mountains in Washington and Oregon.

The upper Columbia River geographic area includes the mainstem Columbia River and all tributaries upstream of Chief Joseph Dam in Washington, Idaho, and Montana. Within this area, bull trout are found in two large basins, the Kootenai River and Pend Oreille River, which includes the Clark Fork River. Historically, bull trout were found in larger portions of the area. Numerous dams and degraded habitat have fragmented bull trout habitat and isolated fish into 71 subpopulations in 9 major river systems, as follows (with the number of subpopulations within each system)--Spokane River (1), Pend Oreille River (3), Kootenai River (5), Flathead River (24), South Fork Flathead River (3), Swan River (3), Clark Fork River (4), Bitterroot River (27), and Blackfoot River (1). The high number of subpopulations (27) in the Bitterroot River system, Montana, indicates a high degree of habitat fragmentation where numerous groups of resident bull trout are restricted primarily to headwaters. Bull trout are thought to be extirpated in 64 streams and lakes of various sizes, including--Nespelam, Sanpoil, and Kettle Rivers; Barnaby, Hall, Stranger, and Wilmont Creeks; 8 tributaries to Lake Pend Oreille; 5 tributaries to Pend Oreille River below Albeni Falls Dam; Lower Stillwater Lake; upper Clark Fork River, 12 streams in the Coeur d'Alene River basin; and approximately 25 streams in the St. Joe River basin (IDFG 1995).

The upper Columbia River area contains several strong subpopulations of bull trout (USDI 1998b). Bull trout subpopulations are considered strong in South Fork Flathead River and Swan River. Trends in abundance are stable in South Fork Flathead River, and increasing in Swan River (Rieman and Myers 1997). Although high numbers of bull trout are found in Lake Pend Oreille and the upper Kootenai River, trends in abundance are either negative or unknown. The Service considers 50 of the 71 subpopulations in the upper Columbia River drainage at risk of extirpation because of naturally occurring events due to isolation, single life-history form, and low abundance.

In summary, the Columbia River DPS has declined in overall range and numbers of fish. Though still widespread, there have been numerous local extirpations reported throughout the Columbia River basin. The population segment is composed of 141 subpopulations indicating habitat fragmentation, isolation, and barriers that limit bull trout distribution and migration within the basin. Although some strong subpopulations still exist, bull trout generally occur as isolated subpopulations in headwater lakes or tributaries where migratory fish have been lost.

Status of the Clark Fork River Subbasin: The Clark Fork River subbasin is one of many major watersheds which make up the Columbia River basin. Just as the Columbia River basin DPS is comprised of multiple watersheds, the Clark Fork River subbasin is comprised of many smaller drainages. A discussion of bull trout status in each of these drainages follows. The purpose of this discussion is to describe bull trout status at a smaller spatial scale than the larger distinct population segment and to put the proposed project into proper spatial context. The Rock Creek in the action area of this proposed project, is a tributary to the lower Clark Fork River, just one of the drainages in the Clark Fork subbasin discussed below (Figure B1).

Flathead River: Kerr Dam blocks fish passage between the lower Flathead and Clark Fork Rivers and Flathead Lake (Figure B1). Additionally, dams constructed to create irrigation reservoirs isolates many tributaries from the lower Flathead River. Bull trout typically occur in these systems in low densities (MBTSG 1996c).

Bull trout numbers in Flathead Lake have been estimated based upon redd counts in the North and Middle Forks of the Flathead River. A significant decline in redd numbers occurred during the early 1990s due to alteration of the trophic dynamics in Flathead Lake. From 1992 to 1997, the number of bull trout redds remained relatively stable but was about 70 percent below the average during the preceding 12 years (Deleray et al. 1999). Since then, redd numbers have rebounded somewhat, but have not reached 1980s levels.

Bull trout abundance has declined equally in wilderness streams, Glacier National Park streams, and managed streams. Bull trout habitat has improved since monitoring began in the early 1980s suggesting stream habitat is not limiting bull trout (Deleray et al. 1999). Bull trout abundance is declining in Flathead River system primarily from changes in Flathead Lake's food web. Lake trout and lake whitefish (*Coregonus clupeaformis*) expanded with the introduction of Mysis, which has resulted in a decline of bull trout, likely due to competitive and predatory interactions (Deleray et al. 1999). Hungry Horse Dam blocks migratory fish in Flathead Lake from accessing streams in the South Fork Flathead River drainage. The dam isolated about 40 percent of the spawning habitat available for spawning bull trout from Flathead Lake.

The South Fork Flathead River is considered a strong subpopulation of bull trout (USDI 1998c). This drainage supports an intact native fish assemblage as brook trout and lake trout are not present and it is considered a pristine, natural, unmanaged river within the wilderness. South Fork bull trout use Hungry Horse Reservoir as a surrogate for Flathead Lake. No historical data documents fish densities in the South Fork Flathead River prior to dam construction. These streams currently support some of the highest densities of fish in the Flathead Basin. Based upon redd counts, biologists estimated about 2,200 adult bull trout in Hungry Horse Reservoir between 1993 and 1998 (Deleray et al. 1999). Further evidence of a stable bull trout abundance in the South Fork Flathead River basin is provided by gill net catch rates in Hungry Horse Reservoir. Current catch rates are similar to historical rates dating back to 1958 (Deleray et al. 1999).

<u>Swan River</u>: Historically bull trout in Flathead Lake had access to the Swan River drainage and were widely distributed in the Swan River drainage (Figure B1). Completion of the Bigfork Dam in 1902 severed this connection. Bull trout from Flathead Lake no longer have access to the Swan River.

Bull trout abundance in the Swan River is considered relatively healthy by the Montana Bull Trout Restoration Team and redd count data indicate increasing numbers. Bull trout rear in tributary streams, mature in Swan Lake, and then ascend Swan River to their natal tributaries to spawn. Redd count data in the Swan River is among the longest running bull trout monitoring data set in the State of Montana. The Swan River contains one of the few strong bull trout subpopulations in Montana (USDI 1998c).

Nonnative fish may play an important role in the future status of Swan River bull trout. Brook trout are widespread in tributary streams. Northern pike are found in Swan Lake and Swan River and likely compete with adult bull trout for forage and prey on juvenile bull trout. During the fall of 1999, several adult lake trout were captured in Swan Lake. An increase in lake trout numbers will likely detrimentally impact bull trout (MBTSG 1996a).

Bitterroot River: Bull trout were probably once widely distributed throughout the Bitterroot River and its tributary streams (Figure B1). Bitterroot River bull trout may have historically consisted of migratory fish in the Bitterroot River and resident fish in isolated headwater tributaries.

The present distribution of bull trout in the Bitterroot drainage is reduced from historic levels, and the migratory life form has nearly disappeared. Bull trout are rare in the Bitterroot River (MBTSG 1995a). The strongest remaining migratory component occurs in the East and West Forks of the Bitterroot River. The prevalent life form of bull trout in the Bitterroot drainage today is isolated resident fish in higher elevation streams that are frequently dewatered in the lower reaches.

In general, Bitterroot River tributary streams now contain subpopulations of small bull trout in the upper reaches, isolated from other bull trout, resulting in little or no genetic interchange. Habitat degradation, dewatering and other passage barriers have severed the connections between many of the tributaries and the mainstem Bitterroot River.

Blackfoot River: Historically, bull trout were likely widely distributed throughout the Blackfoot drainage (Figure B1). Migratory bull trout had access to the Blackfoot River from the Clark Fork River as far downstream as Lake Pend Oreille. The connection between the two rivers was broken with the construction of Milltown Dam in 1906. In the 1980s, the Blackfoot River bull trout were characterized by declining abundance and local extirpations in several watersheds (Pierce et al 2001).

Currently, the Blackfoot River appears to support a rebounding subpopulation of fluvial bull trout. Bull trout occupy 30 percent of inventoried tributaries in the drainage. Migration data from radio telemetry studies reveal upper and lower components to the subpopulation. Since recovery efforts began in 1990, bull trout in the lower portion of the drainage have displayed increased abundance, redd counts, and fish size. Bull trout in the upper portion of the drainage are less abundant. Increased redd counts are likely a response to a concerted effort to restore and reconnect habitat as well as more restrictive angling regulations. Increasing recreational fishing pressure along with angler inability to distinguish bull trout from legally harvestable species of trout (e.g., brook trout) has adversely impacted bull trout in the past and continues to be a concern (MBTSG 1995b; Pierce et al 2001).

Upper Clark Fork River: Historically, bull trout were likely distributed throughout the upper Clark Fork River, as there are no major natural barriers excluding bull trout from major portions of the drainage (Figure B1). A century of mining and smelting polluted streams in the upper Clark Fork River system with toxic metals and other chemicals (MBTSG 1995c). Degradation, resulting primarily from historic mining and associated water pollution effectively extirpated migratory bull trout from much of its historic range in the upper Clark Fork River above Milltown dam, upriver from Missoula (Figure B1).

Bull trout in the upper Clark Fork River consist mainly of small-sized, resident fish inhabiting tributaries to the Clark Fork River. Populations are highly depressed and isolated from one another by human created barriers to fish migration, with the exception of Rock Creek (MBTSG 1995c). Rock Creek, a tributary to the upper Clark Fork River, not the stream in the action area of this project, contains fluvial bull trout inhabiting the mainstem and migrating to spawn in tributaries. Rock Creek of the upper Clark Fork supports relatively high abundance of bull trout of multiple life history forms and high quality bull trout habitat.

<u>Middle Clark Fork River</u>: Historically, bull trout were likely distributed throughout the middle Clark Fork River (Figure B1). Milltown Dam blocks fish passage from the middle Clark Fork River to the upper Clark Fork and Blackfoot Rivers. This mainstem river dam and associated habitat fragmentation and degradation are the primary limiting factors for middle Clark Fork bull trout (MBTSG 1996c).

Water quality is improved over the upper Clark Fork River because of dilution by large tributaries, yet migratory bull trout are rare in the mainstem middle Clark Fork River. Several of the larger tributaries support resident bull trout.

<u>Lower Clark Fork River</u>: This area historically was part of a larger population, but currently is fragmented into smaller isolated areas. Fluvial fish are blocked from freely and extensively migrating by several dams on the Clark Fork River. The lower Clark Fork River is separated from Lake Pend Oreille by Cabinet Gorge Dam and from the middle Clark Fork River by Thompson Falls Dam. The lower Clark Fork is further split by Noxon Dam. Despite these limitations, the lower Clark Fork watershed supports bull trout of resident and migratory life history forms. Most of the drainages occupied by bull trout in this watershed are dependent on migratory individuals for bull trout persistence.

Fragmentation of the historic migratory populations by mainstem dams is the major factor affecting the survival and recovery of bull trout in the lower Clark Fork River drainage (MBTSG 1996b). Fragmentation has resulted in smaller, isolated groups of bull trout with decreased tributary accessibility. The migratory component of these smaller units is at a higher threat of extirpation due to their limited abundance and available range. Rearing capacity in the reservoirs is greatly reduced compared to Lake Pend Oreille.

Bull trout currently exist in Noxon Rapids and Cabinet Gorge Reservoirs. These systems are isolated from upstream and downstream reaches, support relatively few bull trout, and are at risk of extirpation. Migratory bull trout use larger tributaries to the lower Clark Fork River for spawning and rearing. Primary spawning tributaries in the system are Prospect Creek, and the Bull, Thompson, and Vermilion Rivers. Movement of fish and associated gene flow between the reservoirs is limited to a downstream direction, although the magnitude of bull trout movement out of either reservoir is unknown.

The proposed project would occur within the lower Clark Fork River drainage. The Montana Bull Trout Scientific Group (1996b) identified tributaries Rock Creek and Bull River as bull trout core areas in the lower Clark Fork River (Figure B2). Core areas were defined as drainages containing the strongest remaining populations of bull trout within each restoration/conservation area. Bull trout abundance may vary widely from one core area to another as they were identified relative to a particular restoration/conservation area. For example, bull trout abundance in Rock Creek or Bull River is relatively low compared to bull trout core areas such as those in the Swan or South Fork Flathead Rivers.

Noxon Dam splits the lower Clark Fork into the Cabinet Gorge Reservoir and the Noxon Rapids Reservoir bull trout subpopulations (USDI 1998c). Noxon and Cabinet Gorge Dams form the upper and lower bounds, respectively, of the Cabinet Gorge Reservoir bull trout subpopulation. The proposed project would occur within the area of this bull trout subpopulation. This subpopulation was characterized as depressed (USDI 1998c) due to its limited distribution, bull trout abundance, and refounding potential from other subpopulations.

The Cabinet Gorge Reservoir bull trout subpopulation consists of bull trout in the reservoir, Bull River, and Rock Creek. Rock Creek bull trout are essentially isolated from Bull River bull trout as they are mainly non migratory fish. As such, Rock Creek bull trout contribute relatively little to the Cabinet Gorge Reservoir subpopulation.

The Bull River likely supports more spawning bull trout than any other Cabinet Gorge Reservoir tributary. Length-frequency data and scale analysis suggest the presence of the migratory life form and raise doubt on the existence of a resident life form; however, this is based on a small sample size and conclusions are tentative at best (Chadwick 2000). Total bull trout abundance estimates for the Bull River system range from 809 (WWP 1996) to 255 fish (Chadwick 2000) drainage wide. The discrepancy in abundance may arise from actual fluctuation in bull trout abundance, but at least partially reflect differences in sampling methods (Chadwick 2000). Bull trout were sampled in the mainstem Bull River and the South, Middle, and East Forks of the Bull River. Seventy percent of bull trout in this system are estimated to reside in a single watershed, the East Fork of the Bull River (Figure B2).

In summary, the Cabinet Gorge Reservoir bull trout subpopulation is relatively small in size and bull trout numbers compared to other subpopulations throughout the Columbia River basin bull trout DPS. It is a small portion of bull trout range isolated from upstream and downstream areas by dams. This subpopulation contains only 66 of approximately 8,000 miles of potentially occupied bull trout habitat in the Clark Fork River watershed (W. Fredenberg, pers. comm., 2002). Habitat suitability and bull trout abundance in this subpopulation is relatively low compared to subpopulations such as those in the South Fork Flathead, Blackfoot, and Swan Rivers. Its small, isolated nature, limited bull trout abundance, suboptimal habitat suitability, and low refounding potential from other subpopulations led to characterizing this subpopulation as depressed (USDI 1998c).

Analysis of the Species/critical Habitat Likely to Be Affected

The proposed action would occur in a portion of the lower Clark Fork River watershed currently occupied by the Cabinet Gorge Reservoir subpopulation of bull trout (USDA 1999). Bull trout are listed as threatened under the Endangered Species Act. Designation of bull trout critical habitat has been proposed for the Klamath River and Columbia River distinct population segments of bull trout.

Status of Proposed Critical Habitat

In November 2002, the Service proposed designation of critical habitat for the Klamath River and Columbia River distinct population segments of bull trout pursuant to the Endangered Species Act of 1973, as amended. For the Klamath River DPS, the proposed critical habitat designation includes approximately 476 km (296 mi) of streams and 13,735 ha (33,939 ac) of lakes and marshes in Oregon. For the Columbia River DPS the proposed critical habitat designation totals approximately 29,251 km (18,175 mi) of streams and 201,850 ha (498,782 ac) of lakes and reservoirs, which includes--approximately 14,416 km (8,958 mi) of streams and 83,219 ha (205,639 ac) of lakes and reservoirs in the State of Idaho; 5,341 km (3,319 mi) of streams and 88,051 ha (217,577 ac) of lakes and reservoirs in the State of Montana; 5,460 km (3,391 mi) of streams and 18,077 ha (44,670 ac) of lakes and reservoirs in the State of Oregon; and 4,034 km (2,507 mi) of streams and 12,503 ha (30,897 ac) of lakes and reservoirs in the State of Washington (USDI 2002a).

Critical habitat consists of physical and biological features essential to the conservation of the species and that may require special management considerations or protection. These physical and biological features include, but are not limited to: space for individual and population growth, and for normal behavior; food, water, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, or rearing of offspring; and habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species. All areas proposed as critical habitat for bull trout are within the historic geographic range of the species and contain one or more of these physical or biological features essential to the conservation of the species (USDI 2002a).

The primary constituent elements for bull trout were determined from studies of their habitat requirements, life-history characteristics, and population biology. Primary constituent elements may include, but are not limited to, features such as spawning sites, feeding sites, and water quality or quantity. An area need not include all nine of the primary constituent elements to qualify for designation as critical habitat (USDI 2002a).

Specifically, these primary constituent elements are:

(1) Permanent water having low levels of contaminants such that normal reproduction, growth and survival are not inhibited;

(2) Water temperatures ranging from 2°to 15°C (36° to 59°F), with adequate thermal refugia available for temperatures at the upper end of this range. Specific temperatures within this range will vary depending on bull trout life history stage and form, geography, elevation, diurnal and seasonal variation, shade, such as that provided by riparian habitat, and local groundwater influence;

(3) Complex stream channels with features such as woody debris, side channels, pools, and undercut banks to provide a variety of depths, velocities, and instream structures;

(4) Substrates of sufficient amount, size, and composition to ensure success of egg and embryo overwinter survival, fry emergence, and young-of-the-year and juvenile survival. A minimal amount of fine substrate less than 0.63 cm (0.25 in) in diameter and minimal substrate embeddedness are characteristic of these conditions;

(5) A natural hydrograph, including peak, high, low, and base flows within historic ranges or, if regulated, a hydrograph that demonstrates the ability to support bull trout populations;

(6) Springs, seeps, groundwater sources, and subsurface water connectivity to contribute to water quality and quantity;

(7) Migratory corridors with minimal physical, biological, or chemical barriers between spawning, rearing, overwintering, and foraging habitats, including intermittent or seasonal barriers induced by high water temperatures or low flows;

(8) An abundant food base including terrestrial organisms of riparian origin, aquatic macroinvertebrates, and forage fish; and

(9) Few or no predatory, interbreeding, or competitive nonnative species present.

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities leading to the current status of the species, its habitat (including designated critical habitat), and ecosystem in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area which have already undergone section 7 consultation, and the impacts of State and private actions which are contemporaneous with the consultation in progress.

Status of the Species Within the Action Area

The action area for this biological opinion is the Rock Creek drainage and Cabinet Gorge Reservoir downstream from the Rock Creek confluence to Cabinet Gorge Dam within the lower Clark Fork River (Figure B2). A portion of the Cabinet Gorge Reservoir bull trout subpopulation lies within the action area.

Cabinet Gorge Reservoir

Impacts to migratory fish caused by Cabinet Gorge Dam are well documented (Pratt and Huston 1993; WWP 1998). Construction of the Cabinet Gorge Dam in 1952 eliminated access from Lake Pend Oreille upstream to a substantial portion of the remaining lower Clark Fork River tributaries, including Rock Creek. Cabinet Gorge Dam acts as a sink for Rock Creek and Cabinet Gorge Reservoir fish migrating downstream. Any individuals moving past the dam are lost from this system. It is no longer possible for juvenile bull trout migrating from tributaries to travel downstream to Lake Pend Oreille for maturation and return as adults.

The existing reservoir does not provided an adequate surrogate for Lake Pend Oreille. Cool water habitat conditions are limited in the reservoir. Reservoir habitat conditions are largely unsuitable for bull trout (WWP 1995a) and are considered degraded by State of Montana standards as they pertain to supporting a cold water fishery. Bull trout growth and survival rates are likely decreased from predevelopment conditions (Table B3). This shift in habitat suitability is evidenced by the highly successful bass fishery and dominance by generalist fishes (WWP 1995b).

Table B3.
Baseline Indicators and Documentation for Rock Creek Bull Trout Rated as Functioning Appropriately (FA), Functioning at Risk (FAR), or Functioning at Unacceptable Risk (FUR) (USDA 1999, 2000)

INDICATOR	ROCK CREEK VALUES	RATING
Subpopulation size	Greater than 2000 individuals, low habitat complexity, largely isolated system.	FAR
Growth and survival	Growth rates are low and not expected to improve within the next life cycle of bull trout. Instantaneous survival rate for bull trout was lower than for other salmonids in Rock Creek.	FAR
Life history and diversity	Absence or rarity of the adfluvial component.	FAR
Persistence and genetic integrity	Presence and threat of brook trout hybridization in the drainage.	FAR
Temperature	12°C summer, 9°C spring/fall, 5°C winter.	FA
Sediment	Range from 10% to 24%.	FA
Nutrients and contaminants	Nutrient levels are low in the Rock Creek drainage. Productivity in the stream is phosphorus limited. Background contaminants include arsenic, cadmium, copper, lead, and zinc which are all naturally present below current detection limits with the exception of zinc at 0.5 µg/l (MDEQ and USDA 2001).	FA
Physical barriers	Intermittent flow, culvert barrier during some flows.	FAR
Substrate embeddedness	No data specific to embeddedness however, core sampling data range from 15.4% to 43.1%.	FA
Large woody debris	Mean 6.8 pieces/100 m below the confluence of the East and West Forks (WWP 1996). Upper East Fork has high levels of LWD (MDEQ and USDA 2001). Mean of 4.6 pieces/100 m greater than 10 ft in length in the West Fork (WWP 1996). Low numbers in mainstem Rock Creek.	FA
Pool frequency and quality	Reduction in pool volume due to sediment loading.	FAR
Large pools	Existing pools are shallow and wide.	FUR
Off-channel habitat	Naturally limited.	FA
Refugia	Currently not adequate.	FAR
Wetted width/ depth ratio	Ratio <10.	FA
Streambank condition	Alluvial terraces are being undermined.	FAR
Floodplain connectivity	Has not been altered.	FA
Change in peak/base flows	Intermittent flow during some times of the year.	FAR
Drainage network increase	Roads lack BMP standards.	FAR
Road density and location	Densities 1.5 to 3.0 mi/mi^2, riparian roads.	FAR
Disturbance history	Equivalent Clearcut Area =15%.	FAR
Riparian conservation areas	Roads and sediment are issues within the RHCA.	FAR
Disturbance regime	Data inadequate.	FAR
Integration of species and habitat conditions	**Minimal migratory component, low habitat complexity and low pool frequency.**	**FUR**

Following construction of Noxon Rapids Dam in 1959, the remaining adult bull trout in Cabinet Gorge Reservoir were prevented from reaching tributaries upstream from the dam and only Pilgrim Creek, Bull River, and Rock Creek remained as potential spawning tributaries. Pratt and Huston (1993) concluded very small numbers of adult bull trout existed in Cabinet Gorge Reservoir.

Pre-impoundment population estimates for migratory adult bull trout range between 2,000 and 10,000 for the lower Clark Fork River (Pratt and Huston 1993). There has been a decrease in the relative abundance of bull trout upstream of Cabinet Gorge Dam. Since the Pratt and Houston (1993) investigations, other studies (WWP 1995a, 1995b, 1996), have confirmed the limited abundance and tenuous nature of bull trout associated with Cabinet Gorge Reservoir. Bull trout numbers within the project area "are small enough to prompt concern about both available genetic diversity and population persistence" (MDEQ and USDA 2001). Extensive sampling since 1993, has found almost no large bull trout in the reservoir or tributaries and evidence of spawning adfluvial fish is lacking. In reservoir tributary reaches accessible to migratory fish, bull trout were the least abundant trout species sampled.

Rock Creek

The size of Rock Creek is classified as a fourth order drainage. The headwaters are in the southwestern end of the Cabinet Mountains. This watershed drains approximately 21,162 acres. Peak flow for Rock Creek is estimated to be between 200 and 300 cfs. Base flow is approximately 2 cfs with a 7-day, 10-year low of 0 cfs (MDEQ and USDA 2001). The mainstem Rock Creek consists of C and D Rosgen channel types through much of its lower reaches. The lower section is typified by low gradient, approximately 2 percent, through much of its length. The watershed contains several areas of sensitive landtypes, which are presently chronic sediment sources. This has resulted in a large volume of bedload and reduced transport efficiency. The trophic condition of the watershed is characterized by low overall primary and secondary productivity (USDA 2000).

The East and West Forks of Rock Creek have gradients of 10.4 and 7.3 percent, respectively (MDEQ and USDA 2001). Rubble and gravel are the co-dominant substrate in the lower reaches associated with large boulders and cobble (WWP 1996; MDEQ and USDA 2001). Steeper sections of the mainstem and the East and West Forks are dominated by cobbles (WWP 1996). Spawning habitat is limited to isolated pockets of gravel behind stable debris or boulders.

Off channel habitat is naturally limited in the Rock Creek drainage. The stream has access to its floodplain but there is limited complexity and potential for back-water areas particularly in the areas of steeper gradient. Connectivity with the Rock Creek floodplain has not been altered by past management activity.

Watershed Consulting (1997) identified the stream banks as a major source of sediment in their surveys. In contrast, WWP (1996) found the majority of the mainstem stream banks to be stable. Watershed surveys have consistently identified three areas contributing sediment to the Rock Creek system. They include Engle Creek, a slump in the West Fork Rock Creek and the stream banks in the mainstem Rock Creek. Sampling done by Watershed Consulting (1997) measured mean percent surface fines at 10 percent, 6.8 percent, and 1.0 percent in Rock Creek, the West Fork and the East Fork, respectively. Washington Water Power measured similar levels of fines in Rock Creek with a mean of 10 percent (Table B1; WWP 1996). Mean percent fines in the West Fork were higher at 24 percent (WWP 1996).

Pool frequency is low in the Rock Creek drainage (Table B1). Most of the available fish habitat is in the form of runs and riffles (WWP 1996). This condition holds true in the low gradient portions of the mainstem Rock Creek. Given the overall low frequency of pools, pool quality also is very low. Stream surveys have consistently identified low pool frequency as a potential aspect for habitat improvement. Width/depth data for pools has not been collected. Width/depth data has been collected for riffles in the mainstem, East Fork and West Fork by Watershed Consulting (1997). The mean ratios are 29, 37, and 19 respectively. Since the dominant habitat type in the Rock Creek system is riffle and glide habitat types this is an accurate description of available habitat.

The mainstem Rock Creek contains a relatively small amount of large woody debris (LWD) relative to other watersheds in the lower Clark Fork River drainage (Table B1; WWP 1996). The potential for future recruitment of LWD is greatly reduced due to past riparian timber harvest and the location of existing roads. Little of the large woody material that enters the active channel is retained. Despite the low abundance of LWD, the thermal regime appears to be functioning appropriately. Low water temperatures ranged from 0.3°C in November up to 12.1°C in August in 1994 (Table B1; WWP 1996).

Mainstem Rock Creek lacks surface flow during periods of base flow for the majority of its lower 3.4 miles. West Fork Rock Creek flows perennially from the falls, approximately 1.6 miles upstream from the confluence of the East Fork Rock Creek, downstream to about 0.2 mile upstream from the confluence. East Fork Rock Creek flows perennially, but loses water near the confluence (Watershed Consulting 1997).

The current level of information present on Rock Creek bull trout is minimal and additional information on fish presence, absence, migration and demographic characteristics are necessary to fully assess the condition of bull trout in this watershed.

Currently, bull trout in the Rock Creek drainage are considered to be primarily of the resident life history form (Table B1). Pratt and Huston (1993) suggests Rock Creek bull trout historically did not have a strong migratory component. However, there have been documented occurrences of larger migratory bull trout in the Rock Creek drainage (USDA 1999). Also, two radio tagged bull trout transported from the Clark Fork River below Cabinet Gorge Dam to Cabinet Gorge

Reservoir were relocated near the mouth of Rock Creek in 2001. This may suggest these fish were attempting to enter Rock Creek to spawn (Lockard et al. 2002). Typically, intermittent stream flow seasonally isolates Rock Creek from the reservoir. The culvert under State Highway 200 has been identified as a potential barrier at some flows (Table B1). Natural barriers have been identified including the ephemeral lower reaches of Rock Creek and a waterfall limiting upstream movement on the West Fork.

Within the Rock Creek drainage, bull trout occur in mainstem Rock Creek, West Fork Rock Creek, and East Fork Rock Creek (Figure B2; USDA 1999). Watershed Consulting (1997) reported 79 percent of the bull trout captured were sampled in the East Fork. Several attempts to determine the number of Rock Creek bull trout were made between 1986 and 1996. Watershed Consulting (1997) and WWP (1996) reported similar bull trout densities in East Fork Rock Creek. The WWP (1996) population estimates extrapolated to the drainage scale from density data collected at the reach scale yield approximately 1,900 total bull trout in Rock Creek and 743 total bull trout in West Fork Rock Creek (Table B1). However, such extrapolations must be viewed cautiously or they may lead to erroneous estimates especially in a system with such variable flow conditions.

Brook trout are present in Rock Creek and may compete or hybridize with bull trout. Risk of hybridization between brook trout and bull trout is increased because the largest component of bull trout in this system is of the resident form.

In summary, the primary concern is the absence of a migratory life history for Rock Creek bull trout in concert with the relatively low habitat complexity and low frequency of pools. The majority of available habitat is only suitable for smaller resident fish. No habitat in the drainage is considered prime habitat for bull trout. These fish would likely benefit from an increased pool habitat and overall habitat complexity. Another reason for concern is the frequency with which the stream goes dry at low flow. If migratory bull trout exist, access to upper reaches of Rock Creek is likely denied in many years due to intermittent flows. The absence of upstream passage over Cabinet Gorge Dam for juveniles migrating below Cabinet Gorge Dam further limits productivity. Marginal rearing conditions in Cabinet Gorge Reservoir are an additional constraint (WWP 1995a). The combined conditions support an integrated rating of species and habitat conditions of functioning at unacceptable risk (Table B1). Low habitat complexity, limited suitable spawning and rearing habitat, stream intermittence, and the rarity of the migratory life history form indicate Rock Creek bull trout are largely isolated and vulnerable to extirpation due to random events (USDA 1999).

Factors Affecting Species Environment Within the Action Area

Cabinet Gorge Reservoir

The Montana Bull Trout Scientific Group (1996b) documented the risks to bull trout in the lower Clark Fork River. Fragmentation of the historic migratory populations in the lower Clark Fork River is considered the highest risk. Fragmentation has reduced potential genetic interchange and accessibility to tributary systems. The migratory component of these smaller, isolated units is at a higher risk of extirpation due to their limited abundance and available range. Other risks to restoration include environmental instability from landslides and rain-on-snow events, thermal problems, rural and residential development, and illegal bull trout harvest. The MBTSG (1996b) concludes adfluvial bull trout in Cabinet Gorge Reservoir are at risk because of fragmented habitat, migration barriers, small available habitat areas, degraded habitat conditions, low predicted survival to emergence, threats of hybridization with brook trout, competition and predation from other introduce fishes, and low bull trout abundance.

The reservoir habitat is suitable for nonnative species such as walleye (*Stizostedion vitreum*) and northern pike (*Esox lucius*). These predatory species likely compete with adult bull trout and prey on juvenile bull trout. Brown trout are another nonnative species with potential impacts on bull trout. Since bull trout and brown trout spawning areas overlap in the Bull River and brown trout spawn later than bull trout, bull trout redd disturbance may be a factor (Pratt and Huston 1993).

The FERC BA (FERC 1999) concluded, based on the licensee's studies (WWP 1995a, 1995b, 1996), "it is now highly likely that many of the adfluvial bull trout populations that historically existed in the reservoir's tributary streams, and were presumed to be maintaining a remnant population, in fact no longer exist." In other words, the bull trout observed in the tributary streams were either small resident fish or juvenile fish remaining from very few spawning adfluvial fish from the reservoir. The restoration plan for bull trout in the Clark Fork River basin in Montana (MBTRT 2000) and the conservation plan for bull trout in Lake Pend Oreille (LPOBTWAG 1999) identify the need to reconnect the Lake Pend Oreille and lower Clark Fork River areas to accomplish restoration goals. Threats and limiting factors identified in the reports include Cabinet Gorge Dam as a barrier to migratory fish movement.

Ongoing mitigation tied to the relicensing of the Avista (formerly known as WWP) owned Lower Clark Fork FERC Project number 2058 includes the Native Salmonid Restoration Plan. The Native Salmonid Restoration Plan strives to address issues related to fish passage and restoration efforts for native salmonids on the lower Clark Fork River. There are two primary objectives relative to fish passage. One objective is to determine whether passage at Cabinet Gorge Dam would effectively increase the viability of bull and westslope cutthroat trout populations in the lower Clark Fork River, its tributaries, and Lake Pend Oreille. The other objective is to re-establish connectivity for migratory native salmonids. Both are essential components to restoration of native salmonids. Additional mitigation measures are being used to support the Rock Creek Watershed council and implement watershed research to describe Rock Creek bull trout and available habitat and restoration to benefit bull trout.

Cooperative efforts between Avista, Montana Fish Wildlife and Parks, and local watershed groups are providing long-term habitat protection through land acquisition, conservation easements, and watershed restoration. Bull trout occurrence in the Cabinet Gorge Reservoir subpopulation could increase as a result of such activities in the Bull River drainage, for example, although not in the action area of this project (Avista 2003).

Rock Creek

Habitat conditions in the Rock Creek watershed are degraded with relatively high levels of sediments present in the spawning gravels and periods of stream flow intermittence occurring in many years (USDA 1999). The past occurrences such as climate change, riparian logging, road building, geologic events, and the 1910 fire have degraded habitat and contributed to Rock Creek's stressed condition (USDA 1999).

Riparian harvest, roads, and other management activity affect lower sections of the stream. The upper sections of the East and West Forks are less impacted. The riparian areas of mainstem Rock Creek have been harvested on much of the private land. The drainage network in Rock Creek has been altered by past road construction. Road 150 runs adjacent to Rock Creek for much of its length. There are 46.1 miles of road within the Rock Creek drainage. This is a road density of 1.5 mi/mi^2 in the Rock Creek drainage. The road density on sensitive land types is 2.2 mi/mi^2. Impacts to the riparian area in Engle Creek also are extensive.

Engle Creek has been impacted by fire and past riparian harvest throughout much of its length. There has been extensive riparian harvest in the lower reaches of Rock Creek as well. The whole watershed was affected by the fires of 1889 and 1910. There has been 2,484 acres of regeneration harvest on the Forest since 1970. Equivalent clearcut acres for the drainage is approximately 12.7 percent.

Environmental Baseline of Proposed Critical Habitat

The Clark Fork River Basin unit includes 12 Critical Habitat Subunits (CHSU), organized primarily on the basis of major watersheds. It includes most of western Montana and the panhandle portion of northern Idaho (USDI 2002a).

The Lower Clark Fork River CHSU includes the three mainstem Clark Fork River impoundments (Cabinet Gorge, Noxon Rapids, and Thompson Falls reservoirs), the Clark Fork River between reservoirs and upstream to the confluence of the Flathead River, the lower

Flathead River drainage downstream from Kerr Dam, and all tributaries to these waters. With the exception of the lower boundary at Cabinet Gorge Dam in Idaho, nearly all the CHSU is located in the northwestern corner of Montana (USDI 2002a).

Major portions of this CHSU, including the entire lower Flathead River drainage, are inside the boundaries of the Flathead Indian Reservation, and fall under the jurisdiction of the Confederated Salish and Kootenai Tribes (CSKT). There are 13 local populations of bull trout in this CHSU--Rock Creek, Bull River, Prospect Creek, Graves Creek, Vermilion River, Fishtrap Creek, West Fork Thompson River, Post Creek, Mission Creek, Dry Creek, and Jocko River (USDI 2002a).

A total of 503 km (312 mi) of 24 streams and 4,862 ha (12,014 ac) of lake surface area in 5 reservoirs (Cabinet Gorge, Noxon Rapids, Mission, McDonald, and Tabor) is proposed for designation as critical habitat for bull trout in this CHSU. Landownership along the streams is approximately 31 percent Federal, 1 percent State, 13 percent CSKT Tribal, and 55 percent private. Landownership on the reservoir shoreline has not been determined, but its mostly private land along the two large reservoirs with less than 25 percent as National Forest. The three small reservoirs are completely surrounded by CSKT Tribal Lands (USDI 2002a).

The Bull River from its confluence with Cabinet Gorge Reservoir upstream 14.3 km (8.9 mi) to the confluence with the South and East forks provides FMO habitat for upstream local populations. Copper Creek from its confluence with the Bull River upstream 7.4 km (4.6 mi) to the headwaters provides rearing habitat (MBTSG 1996b). The East Fork Bull River from its mouth upstream 12.8 km (8 mi) and the South Fork Bull River from its mouth upstream 29.8 km (18.6 mi) provide spawning and rearing habitat for Bull River bull trout (MBTSG 1996b).

Only the Cabinet Gorge Reservoir and Rock Creek portions of proposed critical habitat lie within the action area. Cabinet Gorge Reservoir, 1,295 ha (3,200 ac) at full pool, provides foraging, migratory, and overwintering (FMO) habitat for Bull River and Rock Creek bull trout (Pratt and Huston 1993). Rock Creek from its confluence with Cabinet Gorge Reservoir upstream 11.4 km (7.1 mi) to a natural barrier provides spawning and rearing habitat for Rock Creek bull trout.

Action agencies authorizing activities within lands occupied by bull trout are mandated by the Endangered Species Act of 1973, as amended, to consider the environmental baseline in the action area and effects to bull trout that would likely occur as a result of management actions. To that end, agency biologists use the 4 biological indicators and the 19 physical habitat indicators in the Matrix of Pathway Indicators (matrix) for bull trout to assess the environmental baseline conditions and determine the likelihood of take per interagency guidance and agreement on section 7 consultation on the effects of actions to bull trout (USDA and USDI 1998a, 1998b). Take could occur as direct harm or harassment of individuals or indirectly through adverse impacts to bull trout habitat. The majority of the matrix analysis consists of specific consideration of the 19 habitat indicators. Analysis of the matrix habitat indicators provides a very thorough analysis of the existing habitat condition and potential impacts to bull trout habitat.

While assessing the environmental baseline and potential effects to bull trout as a species, agency biologists have concurrently provided a companion analysis of effects to the PCEs for proposed bull trout critical habitat and related habitat indicators (Appendix F).

Summary of Environmental Baseline for Proposed Critical Habitat

Based on the site specific environmental baseline of bull trout habitat conditions and linkage to the PCEs considering those habitat indicators described in Appendix F and other factors as necessary, all PCEs are in less than optimal condition.

EFFECTS OF THE ACTION

"Effects of the action" refers to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action that will be added to the environmental baseline. Direct effects are considered immediate effects of the project on the species or its habitat. Indirect effects are those caused by the proposed action and are later in time, but are still reasonably certain to occur. Interrelated actions are those that are part of a larger action and depend upon the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consultation.

General Effects of Mining Operations

The U.S. Congress passed the Mining Laws Act of 1872, granting top land-use priority to mineral extraction on all public lands not specifically withdrawn from mineral development. As a result, some 300 million hectares (68 percent of all public land) are open to mining (Sheridan 1977 in Nelson et al. 1991). Extraction of minerals in the United States has frequently deleteriously affected fishery resources in the western United States, and continues to degrade salmonid habitat in many areas (Nelson et al. 1991).

Underground mining and the associated above ground development, can negatively affect bull trout by increasing temperatures, creating acid discharge, and mobilizing toxic heavy metals, producing sediment, creating barriers to fish movement, altering stream channel morphology, and altering stream flow (Nelson et al. 1991; Lee et al.1997; Harvey and Lisle1998).

Water quality (e.g., water temperature and dissolved oxygen) can be altered by activities associated with mining. Stream temperature is affected by eliminating stream-side shading, disrupted subsurface flows, reduced stream flows, and morphological shifts toward wider and shallower channels with fewer deep pools. Loss of streamside vegetation reduces the input of material to the stream that would become or create cover for fish in the future as well as result in changes in water temperature regulation (Lee et al. 1997). Dissolved oxygen can be reduced by low stream flows, elevated temperatures, increased fine inorganic and organic materials that have infiltrated into stream gravels retarding intergravel flows (Chamberlain et al. 1991). Water quantity can be affected by direct removal of water during offstream operations (Martin and Platts 1981).

Soil and site disturbance inevitably occurring during mill construction and use and other underground mining activities are often responsible for increased rates of erosion and sedimentation to streams (Martin and Platts 1981; Lee et al. 1997). The site disturbance is associated with many activities including vegetation removal from the site, vehicular access to the site, installation of stream crossing structures, removal of overburden from the site, re-routing or diversion of streams, construction of settling ponds, and removal and processing of valuable minerals. The amount of sediment actually delivered to streams will depend on site specific factors. The deposition of fine sediments in salmonid spawning and rearing habitat increases mortality of bull trout embryos, alevins, and fry (Shepard et al 1984; Pratt 1984; Fraley and Shepard 1989; Rieman and McIntyre 1993). Sedimentation effects on salmonids can vary significantly depending on salmonid species, stream channel morphology, and stream flows (Harvey and Lisle 1998). For a substrate oriented salmonid like juvenile bull trout, deposition of fine sediments filling spaces between rubble could have a very negative effect on survival, especially overwinter survival. This could reduce the amount of rearing habitat available to juvenile and subadult bull trout as well as adult bull trout. Suspended sediment also can have both acute and sublethal effects on salmonids (Sigler et al. 1984). Suspended sediment levels have to be very high to cause lethal effects, so sublethal effects such as reduced growth are much more likely to occur. Reduction in growth in various salmonid species has been found to occur at suspended sediment concentrations of 100 to 300 mg/l (Sigler et al 1984; McLeay et al. 1987).

Because the supply of large woody debris to stream channels is typically a function of the size and number of trees in riparian areas, it can be profoundly altered by mining activities that remove vegetation in preparation for mining activities. Removal of streamside trees can greatly alter the amount of woody debris in streams over time (Sedell et al. 1988). Shifts in the composition and size of trees within the riparian area affect the recruitment potential and longevity of large woody debris within the stream channel. Large woody debris influences channel morphology, especially in forming pools and instream cover, retention of nutrients, and storage and buffering of sediment. Any reduction in the amount of large woody debris within streams, or within the distance equal to one site-potential tree height from the stream, can reduce instream complexity (Ralph et al. 1994). Large woody debris increases the quality of pools and provides hiding cover, slow water refuges, shade, and deep water areas (Hauer et al. 1999). Ralph et al. (1994) found instream wood to be significantly smaller and pool depths significantly shallower in intensively logged watersheds. The size of woody debris in a watershed subjected to streamside tree removal in Idaho was smaller than that found in a relatively undisturbed watershed (Overton et al. 1993).

Exposing rock strata to weathering and erosion through removal of vegetation and overburden can result in higher levels of metals in streams (Martin and Platts 1981). Metals such as arsenic cadmium, zinc, copper, and mercury all pose risks for aquatic organisms depending on site-specific water chemistry. Combinations of several metals may pose greater risks despite concentrations for each being below its own toxicity threshold (Wels and Wels 1991). Generally, severe metal contamination is more associated with erosion from milled tailings and waste rock, or acid mine discharge associated with either open pit or underground mines.

Laboratory studies have shown that trout and salmon can detect low levels of metals and actively select lower metals concentrations when given the choice. Woodward et al. (1997) documented that Snake River cutthroat trout will avoid mixtures of cadmium, lead, and zinc. Additional tests documented avoidance behavior in cutthroat trout for copper (6 µg/l) and zinc (28 µg/l). Woodward et al. (1995) showed that brown trout avoided mixtures where copper and zinc were present in concentrations as low as 6.5 and 32 µg/l, respectively. Further, fish acclimated for 90 days to zinc at 55 µg/l, preferred lower concentrations (28 µg/l), when given the choice.

Field studies also have documented the avoidance of metal concentrations by wild fish. Spawning Atlantic salmon in New Brunswick displayed avoidance behavior of metals (primarily copper and zinc) at thresholds of 17-21 µg/l for copper mixed with 210-258 µg/l zinc originating from hardrock mining activities (Sprague et al. 1965; Saunders and Sprague 1967 both in Henry and Atchison 1991).

Many mining projects involve road construction, re-construction and use, which results in further adverse effects. Roads built in forested watersheds can cause mass soil movement and surface erosion, resulting in soil creep, slumping, earthflows, and debris avalanches (Meehan 1991).

Roads are recognized as a long-term source of sediment for extended periods even after erosion control measures have been implemented (Furniss et al. 1991, Belt et al. 1992). Ground disturbance from road blading, particularly where the road is immediately adjacent to streams and at both intermittent and perennial stream crossings can result in elevated levels of sediment introduction. Ditch maintenance is another source of sediment delivery to streams. Increased erosion occurs within the ditch as a function of cleaning, pulling, or heeling, increased rate of slides in the cutslope (if the cutslope is undercut), and long-term risk of increased sedimentation from vegetation or ditch rock removal within the ditch. Delivery of available sediment to streams can vary substantially depending on the level of best management practices in effect on a given road (Belt et al. 1992). Installation of cross drainage structures and maintenance of buffers between the roads and the streams reduce sediment delivery to streams.

Other activities associated with road activities such as ditch maintenance, culvert cleaning, riprapping, crossing structure activities also may increase sediment delivery to streams. Snowplowing can result in increased erosion of the road surface and fill slopes as thawing occurs in the spring. Water flowing down ruts in plowed roads and water flowing off the road onto fill slopes are the primary cause of increased sediment delivery. Installation of new cross drainage features as well as cleaning existing ones can result in some short term increases in sediment delivery, but will help reduce long term sediment delivery to streams during road maintenance activities.

In addition to roads, there may be effects to bull trout related to the various petroleum products commonly used in mining operations. Petroleum can cause environmental harm by toxic action, physical contact, chemical and physical changes within the soil or water medium, and habitat alteration. Oil spills have caused major changes in local plant and invertebrate populations lasting from several weeks to many years. Effects of oil spills on fish have been difficult to determine beyond the immediate losses in local populations. Drilling fluids, sometimes used in great quantities at mining sites, were found to be toxic to rainbow trout at concentrations less than 100 mg/L (Sprague and Logan 1979 in Nelson et al. 1991). Chemicals used in processing and recovery of metalliferous deposits may be toxic. Webb et al. (1976) reported the flotation reagents sodium ethyl and potassium amyl xanthate were highly toxic to rainbow trout.

While it is unlikely large numbers of fish inhabiting large, deep bodies of water would be killed by the toxic effects of spilled petroleum, fish kills may be caused by large amounts of oil moving rapidly in shallow waters such as shallow streams. Oil and petroleum products vary considerably in their toxicity, and the sensitivity of fish to petroleum varies among species. The sublethal effects of oil on fish include changes in heart and respiratory rates, gill hyperplasia, enlarged liver, reduced growth, fin erosion, impaired endocrine system, and a variety of biochemical, blood, and cellular changes, and behavioral responses (Weber et al. 1981). Therefore, a fuel spill into the stream related to a mining operation could directly poison bull trout or indirectly affect bull trout by poisoning invertebrate or vertebrate prey species.

Specific Effects of Mining Operations on Rock Creek

Impacts related to water quality and quantity because of the construction and operation of Rock Creek mine are primarily expected to adversely affect fish, aquatic macroinvertebrates, and plants. Expected impacts include a reduction in numbers of individuals, changes in species composition, and a reduction in species diversity.

Habitat fragmentation and isolation because of Cabinet Gorge and Noxon Dams are the greatest risk to the persistence of the migratory form of the Cabinet Gorge Reservoir bull trout subpopulation (MBTSG 1996b). Currently, Rock Creek bull trout are primarily of the resident life history form (USDA 1999) and are at high risk of extirpation from localized catastrophic events due to the limited area inhabited by bull trout and the relatively low availability of high quality habitat in Rock Creek. Direct loss of individuals and indirect adverse effects from additional habitat modifications would likely reduce the likelihood of persistence of Rock Creek bull trout. Such effects increase the risk of extirpation of Rock Creek bull trout and affect the long-term viability of the Cabinet Gorge Reservoir bull trout subpopulation by potentially decreasing the available genetic diversity.

Additional risks related to the mine would further compromise the continued existence of Rock Creek bull trout. For example, changes in habitat conditions also are expected to favor non-native brook trout. In the western United States, where brook trout have been introduced into bull trout habitat, habitat degradation generally favors brook trout, thus yielding a competitive edge over bull trout (Rieman and McIntyre 1993). Brook trout interbreed with bull trout, offspring are most often sterile; however, there has been some evidence of F2 hybrids in other drainages, an indication of successful breeding of hybrid offspring (Hansen 2001).

Monitoring and Mitigation Plans

The proposed action includes the future refinement and approval of monitoring and mitigation plans for bull trout by the Sterling Mining Company, in cooperation with the MDEQ, the Forest, and the Service. Appendix K of the FEIS contains a complete description of the conceptual monitoring and mitigation plans for Alternatives III through V developed by MDEQ and the Forest.

The Sterling Mining Company would develop final monitoring and mitigation plans prior to project startup. The regulatory agencies will review and refine the plans as an interagency team. To minimize impacts to bull trout, the plans potentially directly affecting the fishery would be reviewed from a fisheries perspective. The Service will participate as needed and will require the Forest fishery biologist, hydrologist, geologist, and soil scientist will be involved in issues related to water use, fishery monitoring plans, sediment abatement plans and monitoring, and groundwater. All plans would identify trigger or alert levels, which would require Sterling Mining Company to implement a corrective action plan. Corrective action plans for the most likely scenarios need to be developed and approved prior to project startup.

All monitoring would require an annual report unless otherwise specified. The reporting format and requirements would be reviewed and finalized by MDEQ, the Forest, and the Service. Reports would be submitted to other review agencies as identified by the Forest and MDEQ. After submittal of a monitoring report, the regulatory agencies and all other relevant agencies would review the monitoring plan and results, and evaluate possible modifications to the plan or permitted operations.

Monitoring and mitigation plans to be refined, approved and ultimately included in the plan of operations include:

Air Quality Monitoring
Rock Mechanics Monitoring
Acid Rock Drainage and Metals Leaching Plan
Evaluation Adit Data Evaluation Plan
Tailings Paste Facility and Tailings Surry Line Construction Monitoring Plan
Soils and Erosion Control Plan
Reclamation Monitoring Plan
Water Resources Monitoring Plan
Influent and Effluent Monitoring Plan
Monitoring of Biological Oxygen Demand Plan
Wildlife Mitigation an Monitoring Plan

Threatened and Endangered Species Mitigation Plan
Aquatics and Fisheries Monitoring and Mitigation Plan
Hard Rock Mining Impact Plan
Wetlands Mitigation Plan

Water Temperature and Groundwater Influence

As part of this project, right-of-way clearing within the riparian area is expected to facilitate road, powerline and pipeline construction and maintenance (Figure 2). Previous logging activities have already reduced existing shading to the stream, and these activities are expected to add to that cumulative loss (USDA 1999). Additional loss of riparian vegetation may affect stream temperatures within Rock Creek.

The loss of groundwater to interception by the mining activities also is expected to influence stream temperatures in Rock Creek (USDA 1999). Impacts to seeps and wetlands in the area are expected to adversely affect groundwater flows. The groundwater provides a cooling effect and is important to maintaining colder stream temperatures essential for high quality spawning and rearing habitat. The loss of groundwater recharge and upwellings resulting from the removal and discharge of between 1,700 and 2,046 gpm during mining operations is expected for the life of the mining operations and possibly after mine closure. Groundwater upwelling is important to the success of spawning and successful incubation of eggs to larval stage (Baxter and Hauer 2000). The loss of groundwater and the effect to bull trout are difficult to predict and monitoring is proposed to detect any mining induced changes in groundwater components of the water quantity and chemistry budgets in Rock Creek.

The threat to overlying lakes and streams is associated with groundwater drainage stress. Cliff Lake and Moran Basin receive much of their inflow from groundwater and subsequently recharge the groundwater system down gradient (Gurrieri 2001). Because the underlying rock is highly fractured, mine dewatering during operation may reduce groundwater input to the lakes and subsequent output from the lakes. This may reduce baseflows in streams receiving groundwater down gradient of the lakes. The risk of groundwater drainage stress is listed moderate for Cliff Lake and Moran Basin. To reduce risk of groundwater drainage stress to low, a buffer zone of 1,000 feet around Cliff Lake would be maintained. In addition, monitoring subsurface hydraulic conditions would allow early detection of potential mining impacts and grouting of groundwater inflows to the mine. The Corrective Action Plan would identify measures to be taken should monitoring identify potential water resources issues. Hydrogeologic information collected during evaluation adit construction would be used to develop these measures and evaluate their effectiveness (MDEQ and USDA 2001).

Buffer zones are assumed effective in reducing the impact to overlying lakes and down gradient streams, but mine related effects to groundwater flow and chemistry are very difficult to predict reliably. The case studies of other mines presented by Gurrieri (2001) provide evidence of the unpredictable nature of groundwater flow in fractured rocks. In this instance, the Troy mine serves as a close analog to predict impacts from mining because of its similar location, climate, geology, and structure (Gurrieri 2001). Disruptions of surrounding surface water bodies has not been documented, but no lakes or perennial streams directly overly the Troy mine and intensive monitoring has not been conducted. Gurrieri (2001) concludes the likelihood of impact would be reduced to low for both lakes given proposed mitigation.

An additional risk to down gradient streams is post-closure leakage of groundwater containing dissolved metals from the mine to the surface. After mine closure, groundwater from the mine could leak through rock fractures down gradient to the surface and into streams. Because of high risk of impact to North Basin and South Basin Creeks, 1,000-foot buffer zones near ore outcrops and post-closure mine dewatering would be maintained to reduce risk to these down gradient streams. Such mitigation would reduce the likelihood of impact to low (Gurrieri 2001).

The only certain mitigation to avoid post-closure leakage of dissolved metals to the surface is mine dewatering after closure. However, this would have to be done in perpetuity, and mine dewatering after closure would maintain the groundwater drainage stress on overlying lakes and streams since dewatering and adit plugging are mutually exclusive. If the mine is left to passively drain from the adit, the mine would flood to the level of the adit and possibly discharge to the North Basin and Copper Gulch, tributaries to the Bull River system. Again, 1,000-foot buffer zones near ore outcrops and post-closure mine dewatering would be maintained for these down gradient streams. Such mitigation would reduce the likelihood of impact to low (Gurrieri 2001). Based on this information, the Service does not anticipate adverse impacts to bull trout in the Bull River drainage.

Substrate Composition and Fine Sediment

The most obvious direct impact of the construction and operation of the Rock Creek Mine to bull trout is the increased level of fine sediments entering the stream during the construction phase. Activities associated with the development of the mine include road construction, road reconstruction, bridge and culvert replacement, alteration of existing roads to conform to Best Management Practices Standards (BMPs), construction and development of tailings ponds, adit and mill sites, powerlines, and pipelines.

Sediment loading is predicted to increase above existing conditions, 46 percent in the West Fork of Rock Creek, 20 percent in the East Fork of Rock Creek, and 38 percent overall for the entire Rock Creek watershed (USDA 1999; Figure 2). The highest levels of sediment are expected to occur during the 5-year construction period with decreasing levels of additional sediment entering the stream during the 35-year operating life of the mine. Fine sediment levels in Rock Creek spawning gravels are already at numbers that reduce bull trout survival. Increased sediment levels in spawning gravels are known to lower the survival of salmonid eggs to the emergence stage (Weaver and Fraley 1993). Increases in sediment levels to certain thresholds (more than 30 percent of materials less than 6.4 mm) results in embeddedness associated with sharp declines in juvenile bull trout densities (Shepard et al 1984). Very little spawning habitat is available in Rock Creek, and that habitat currently contains high levels of sediment. Any increase in sediment deposition is a risk to bull trout habitat productivity and survival rate.

Sedimentation increases embeddedness and results in decreased aquatic insect production and diversity. Juvenile bull trout feed primarily on aquatic macroinvertebrates and the distribution of aquatic macroinvertebrates inhabiting running water environments is highly dependent on substrate particle size (Cummins and Lauf 1969). Increased levels of deposited sediment reduce the quantity of the food base for bull trout resulting in slower growth rates, higher mortality, and reduced fecundity of bull trout.

An indirect effect of the proposed action relates to impacts of increased levels of sediment on stream habitat characteristics and the effects of those impacts on bull trout and prey availability. Such indirect effects may include changes in stream channel morphology and decreased availability and quality of interstitial spaces affecting rearing habitat, resulting in lower juvenile survival. Any habitat changes may be aggravated by a decreased availability of water supply to the stream caused by disruption of ground water and surface drainage patterns as well as direct withdrawal of water.

The Aquatics and Fisheries Monitoring Plan would require fine sediment monitoring to determine if BMPs and other mitigation are effective or if impacts to aquatic resources are occurring.

Water Quality and Metals Concentrations of Discharge Water

Mining activity may release available metals and add to baseline conditions. Increasing the concentration of dissolved heavy metals in soft water environments (Rock Creek = 10 mg/l) can result in a corresponding increase in toxicity to fish. Fish are much more susceptible to metals toxicity in soft water environments (Nelson et al. 1991).

Groundwater infiltration of metals contamination to Rock Creek also may result from this project. Groundwater quality impacts from waste rock seepage, tailings seepage, tailings impoundment structures and underground mine pool, during operations and upon closure of the mine, are expected. If the metals concentrations are elevated in the groundwater and then flow to Rock Creek, aquatic organisms may be adversely impacted.

Discharge of treated mine water and the effluent outfall may deter upstream migration of bull trout. Treated effluent would be discharged into the Clark Fork River about 750 feet upstream from the mouth of Rock Creek (Figure 2). Elevated metals levels may cause bull trout to avoid use of Rock Creek as a spawning or rearing area. The metal concentrations in the mixing zones are not expected to be detrimental to fish homing behavior. However, metal concentrations could increase near the mouth of Rock Creek as a result of groundwater seepage and surface erosion of metals from the paste storage facility. If Rock Creek metal concentrations increase to the point they exceed those in the Clark Fork River, then avoidance may be exhibited by fish wanting to reside in the cold water refugia at the mouth of Rock Creek.

Because bull trout have not been tested for dissolved metal concentration avoidance behavior, it is uncertain how they might react to increased concentrations of copper and zinc in Rock Creek. However, the above listed criteria are considered conservative estimates for avoidance behavior associated with copper and zinc concentrations. The Montana Pollution Discharge Elimination System (MPDES) currently allows concentrations less than estimated avoidance thresholds, so MPDES standards would be exceeded prior to reaching estimated avoidance thresholds.

The mine is expected to operate within guidelines established by the Clean Water Act and all applicable State of Montana water /environmental quality laws. Those guidelines are established, administered and enforced by EPA and MDEQ. Under Alternative V, mine water would continue to be treated until it met MPDES effluent limits without treatment. If the adits were not to be plugged then water meeting the MPDES limits with or without treatment would be discharged into the Clark Fork River in perpetuity unless the discharge eventually met standards for discharge into Rock Creek. If a decision was made to plug the adits, then only the water flowing into the adits would be treated for discharge until the appropriate standards or limits were achieved without treatment (MDEQ and USDA 2001). The Water Resources Monitoring Plan would require water quality monitoring to quantify any measurable environmental impacts due to the flow rate and water quality discharged to the Clark Fork River. The Aquatics and Fisheries Monitoring Plan would require aquatic macroinvertebrate, periphyton, and fish tissue monitoring to determine if water quality related impacts are occurring.

Catastrophic Failure

Catastrophic failure of the contingency tailings impoundment or paste facility would have significant and long term impacts to aquatic organisms downstream of the project (MDEQ and USDA 2001). Tailings impoundments and stormwater retention ponds can be exceeded and cause failure of the facilities located near the lower portion of Rock Creek (see Figure 1, page 3). This would result in release of tailings slurry, paste material, or untreated storm water runoff from the tailings paste facility and potential delivery to lower Rock Creek and the Clark Fork River downstream to Cabinet Gorge Dam. It is difficult to estimate or predict the probability, magnitude, or long term effects of such events; however, the impacts would likely be significant to bull trout.

The agencies would institute a process to review and evaluate Sterling's final tailings facility design to ensure long-term stability and minimize the probability of failure. The proposed Alternative V paste facility eliminates the type of catastrophic failure potential associated with tailings ponds. In addition, environmental consequences due to transport of material as a result of damage to the facility is essentially negligible due to the dewatered state of the paste. Inherent in the design of the placement of dewatered paste is the tendency for the material to be contained and able to be graded or re-worked if slumping or fracturing occurred. Even if there was a mass failure of the paste facility, the relatively high viscosity of the paste would be sufficient to retard flow over any appreciable distance. Conditions which could change the character, and hence the behavior of the paste tailings include a change in moisture content of the paste. However, there would need to be a significant increase in moisture content throughout the entire paste deposit before overall stability would be compromised. This increase in moisture would not be expected with the strict quality control program that would be implemented by the Agencies (MDEQ and USDA 2001).

The Failure Modes and Effects Analysis (FMEA) looked at a complete failure of the paste facility nonetheless. The likelihood of failure of the paste pile with underdrains under seismic loading for the Bottom-Up design was assigned a likelihood of occurrence of 1 in 10,000 to 1 in 1,000,000; the likelihood of occurrence for the Top-Down approach was estimated at a 1 in a 100 chance to 1 in 10,000 chance. The consequences associated with a failure in both instances were designated as "high" to "extreme," which are defined as "short-term irreversible impact, long-term excursion of water quality," and "catastrophic event, long term impact" respectively (MDEQ and USDA 2001).

Despite the estimated consequences associated with such an occurrence, there are several mitigating measures which could be implemented to reduce this risk of a failure. These include– employ the Bottom-Up construction sequence, install blanket and finger drains beneath the paste facility; continually model and monitor the moisture content of the paste pile during operations to better understand saturation levels, generate a detailed design of the paste plant operations and disposal system to ensure quality assurance and quality control during operation and post-closure. With these compensating factors fully employed, the FMEA analysis estimated the likelihood of failure under the Bottom-Up option as "negligible" (< 1 in 1,000,000 chance of occurring), and the confidence associated with this estimate was considered "high" (MDEQ and USDA 2001).

Direct and indirect effects are likely to occur if a pipeline rupture or vehicle accident results in slurry or hazardous substances entering Rock Creek (USDA 1999). The slurry pipeline, water reclaim line, or discharge pipeline could leak or break, potentially spilling its contents to Rock Creek and possibly the Clark Fork River depending on Rock Creek flow levels. Trucks carrying reagents or concentrate also are at risk of accidents and spill to bull trout waters. Pipeline ruptures or vehicle accidents could occur anywhere from the uppermost portion of West Fork Rock Creek downstream to the mouth of Rock Creek, but not in the East Fork Rock Creek portion of the drainage (Figure 2). Although time, location, and extent of these events are unpredictable, such events have occurred at ASARCO's nearby Troy mine in 1984 and could occur during the life of the Rock Creek mine (MDEQ and USDA 2001). Factors adding to the risks associated with spills include frequency and number of trucks hauling, weather, proximity of the road to live water, effectiveness of spill response equipment, and frequency and thoroughness of maintenance of facilities. In addition to direct effects on fish, such events may result in chronic and long term effects on the habitat's ability to support bull trout. Monitoring and mitigation plans are expected to address the necessary requirements to minimize impacts in the event of a spill.

Emergency Action Plans would be required prior to mine operation to facilitate monitoring and mitigation in the event of accidental discharge of toxic or hazardous materials or sediments which could adversely impact the environment. The Acid Rock Drainage and Metals Leaching and Water Resources Monitoring Plans would require testing and monitoring of the paste tailings to determine tailings and tailings impoundment facilities impacts to surface and ground water.

Species' Response to a Proposed Action

The expected bull trout population response to the ongoing mining operations is associated with impacts to the aquatic habitat and the resulting impacts to individual bull trout and the Cabinet Gorge Reservoir bull trout subpopulation. Increased sediment from the proposed mining activities has potential to impact several life stages of bull trout within the action area during the proposed project. Increases in sedimentation affect incubation, emergence, and survival rates of eggs, fry, and juveniles. Fine sediment fills spaces between the gravel needed by incubating eggs and fry. Because bull trout eggs incubate about 7 months in the gravel, they are especially vulnerable to fine sediment and water quality degradation (Fraley and Shepard 1989). Juveniles are similarly affected, as they also live on or within the streambed cobble (Pratt 1984).

Given the existing degraded conditions of the watersheds, increases in sedimentation, decreased base flow, and changes in channel and habitat complexity as a result of the proposed project are expected to adversely affect Rock Creek bull trout. Increases in sediment and changes in habitat complexity are considered more than insignificant or inconsequential. Those activities would affect aquatic habitat as well as the associated life stages of bull trout in the Rock Creek watershed. Long term impacts associated with groundwater development, metals contamination, and catastrophic events also are inherent to a proposal of this magnitude and considered risks to bull trout.

Given the tenuous status of the Cabinet Gorge Reservoir bull trout subpopulation and the nature of project related impacts, the likelihood of persistence of this subpopulation may be appreciably reduced in the long term with implementation of Alternative V. Rock Creek bull trout are mainly resident fish and contribute relatively little to the Cabinet Gorge Reservoir subpopulation. A modest portion of this subpopulation would be negatively impacted by proposed project actions. No impacts related to this project are anticipated in the Bull River drainage which is considered to be the principal contributor of the subpopulation because it supports fluvial and resident bull trout. However, this project is expected to have negative impacts on bull trout in one of only two occupied drainages in the subpopulation, so risk of extirpation due to environmental stochasticity is elevated (Rieman and McIntyre 1993).

Effects of the Action to Proposed Critical Habitat

Action agencies authorizing activities within lands occupied by bull trout are mandated by the Endangered Species Act of 1973, as amended, to consider the environmental baseline in the action area and effects to bull trout that would likely occur as a result of management actions . To that end, agency biologists use the 4 biological indicators and the 19 physical habitat indicators in the bull trout matrix to assess the environmental baseline conditions and determine the likelihood of take per interagency guidance and agreement on section 7 consultation on the effects of actions to bull trout (USDA and USDI 1998a, 1998b). Take could occur as direct harm or harassment of individuals or indirectly through adverse impacts to bull trout habitat. The majority of the matrix analysis consists of specific consideration of the 19 habitat indicators. Analysis of the matrix habitat indicators provides a very thorough analysis of the existing habitat condition and potential impacts to bull trout habitat.

While assessing the environmental baseline and potential effects to bull trout as a species, agency biologists have concurrently provided a companion analysis of effects to the PCEs for proposed bull trout critical habitat and related habitat indicators (Appendix F).

Summary of Effects of Mining Operations for Rock Creek Proposed Critical Habitat

The following discussion links site specific project impacts to bull trout habitat to the PCEs. PCE determinations are based on the linkage between the PCEs and associated habitat indicators described in Appendix F and any other factors pertinent to the project analysis.

The Service anticipates activities associated with the proposed mining operation would adversely impact all of the primary constituent elements of proposed bull trout critical habitat in the Rock Creek drainage. Increases in sedimentation, degradation of water quality, changes in channel and habitat complexity related to mining activities are anticipated to adversely affect and degrade aquatic habitat parameters including spawning habitat, rearing habitat, food supply, migratory corridors, and overwintering habitat.

The Forest anticipates the proposed mining activities would continue for approximately 35 years, the life of the plan of operations (USDA 1999). However, mine operation could exceed that time frame and long term effects of mining operations would likely continue indefinitely after mine closure. Impacts associated with groundwater development, metals contamination, and catastrophic events also are inherent to a proposal of this magnitude and considered risks to proposed bull trout critical habitat. Such impacts are difficult to predict, but are not anticipated by the Service. These actions contribute to the overall risk to proposed bull trout critical habitat in the Lower Clark Fork River CHSU and Reasonable and Prudent Measures must be taken to minimize adverse impacts.

Specific Effects of Mining Operations on Rock Creek Proposed Critical Habitat

Impacts related to water quality and quantity because of the construction and operation of Rock Creek mine are primarily expected to adversely affect fish, aquatic macroinvertebrates, aquatic habitat, and plants. Expected impacts include a reduction in habitat quality and diversity, and changes in aquatic species composition.

Monitoring and Mitigation Plans: The proposed action includes the future refinement and approval of monitoring and mitigation plans for bull trout and proposed bull trout critical habitat by the Sterling Mining Company, in cooperation with the MDEQ, the Forest, and the Service. Appendix K of the FEIS contains a complete description of the conceptual monitoring and mitigation plans for Alternatives III through V developed by MDEQ and the Forest.

The Sterling Mining Company would develop final monitoring and mitigation plans prior to project startup. The regulatory agencies will review and refine the plans as an interagency team. To minimize impacts to bull trout and proposed bull trout critical habitat, the plans potentially directly affecting the fishery would be reviewed from a fisheries perspective. The Service will participate as needed and will require the Forest fishery biologist, hydrologist, geologist, and soil scientist will be involved in issues related to water use, fishery monitoring plans, sediment abatement plans and monitoring, and groundwater. All plans would identify trigger or alert levels, which would require Sterling Mining Company to implement a corrective action plan. Corrective action plans for the most likely scenarios need to be developed and approved prior to project startup.

All monitoring would require an annual report unless otherwise specified. The reporting format and requirements would be reviewed and finalized by MDEQ, the Forest, and the Service. Reports would be submitted to other review agencies as identified by the Forest and MDEQ. After submittal of a monitoring report, the regulatory agencies and all other relevant agencies would review the monitoring plan and results, and evaluate possible modifications to the plan or permitted operations.

Monitoring and mitigation plans to be refined, approved and ultimately included in the plan of operations include:

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Reclamation Monitoring Plan
Water Resources Monitoring Plan
Influent and Effluent Monitoring Plan

Monitoring of Biological Oxygen Demand Plan
Wildlife Mitigation an Monitoring Plan
Threatened and Endangered Species Mitigation Plan
Aquatics and Fisheries Monitoring and Mitigation Plan
Hard Rock Mining Impact Plan
Wetlands Mitigation Plan

Water Quality and Metals Concentrations: Mining activity may release available metals and add to baseline conditions. Increasing the concentration of dissolved heavy metals in soft water environments (Rock Creek = 10 mg/l) can result in a corresponding increase in toxicity to fish. Fish are much more susceptible to metals toxicity in soft water environments (Nelson et al. 1991).

Groundwater infiltration of metals contamination to Rock Creek also may result from this project. Groundwater quality impacts from waste rock seepage, tailings seepage, tailings impoundment structures and underground mine pool, during operations and upon closure of the mine, are expected. If the metals concentrations are elevated in the groundwater and then flow to Rock Creek, aquatic organisms and habitat may be adversely impacted.

Risk to down gradient streams is post-closure leakage of groundwater containing dissolved metals from the mine to the surface. After mine closure, groundwater from the mine could leak through rock fractures down gradient to the surface and into streams. Because of high risk of impact to North Basin and South Basin Creeks, 1,000-foot buffer zones near ore outcrops and post-closure mine dewatering would be maintained to reduce risk to down gradient streams. Such mitigation would reduce the likelihood of impact to low (Gurrieri 2001).

The only certain mitigation to avoid post-closure leakage of dissolved metals to the surface is mine dewatering after closure. However, this would have to be done in perpetuity, and mine dewatering after closure would maintain the groundwater drainage stress on overlying lakes and streams since dewatering and adit plugging are mutually exclusive. If the mine is left to passively drain from the adit, the mine would flood to the level of the adit and possibly discharge to the North Basin and Copper Gulch, tributaries to the Bull River system. Again, 1,000-foot buffer zones near ore outcrops and post-closure mine dewatering are proposed as mitigation for these down gradient streams. Such mitigation would reduce the likelihood of impact to low (Gurrieri 2001). Based on this information, the Service does not anticipate adverse impacts to bull trout in the Bull River drainage.

Discharge of treated mine water and the effluent outfall may deter upstream migration of bull trout. Treated effluent would be discharged into the Clark Fork River about 750 feet upstream from the mouth of Rock Creek (Figure 2). Elevated metals levels may cause bull trout to avoid use of Rock Creek as a spawning or rearing area. The metal concentrations in the mixing zones are not expected to be detrimental to fish homing behavior. However, metal concentrations could increase near the mouth of Rock Creek as a result of groundwater seepage and surface erosion of metals from the paste storage facility. If Rock Creek metal concentrations increase to the point they exceed those in the Clark Fork River, then avoidance may be exhibited by fish wanting to reside in the cold water refugia at the mouth of Rock Creek.

Because bull trout have not been tested for dissolved metal concentration avoidance behavior, it is uncertain how they might react to increased concentrations of copper and zinc in Rock Creek. However, the above listed criteria are considered conservative estimates for avoidance behavior associated with copper and zinc concentrations. The Montana Pollution Discharge Elimination System (MPDES) currently allows concentrations less than estimated avoidance thresholds, so MPDES standards would be exceeded prior to reaching estimated avoidance thresholds.

The mine is expected to operate within guidelines established by the Clean Water Act and all applicable State of Montana water /environmental quality laws. Those guidelines are established, administered and enforced by EPA and MDEQ. Under Alternative V, mine water would continue to be treated until it met MPDES effluent limits without treatment. If the adits were not to be plugged then water meeting the MPDES limits with or without treatment would be discharged into the Clark Fork River in perpetuity unless the discharge eventually met standards for discharge into Rock Creek. If a decision was made to plug the adits, then only the water flowing into the adits would be treated for discharge until the appropriate standards or limits were achieved without treatment (MDEQ and USDA 2001). The Water Resources Monitoring Plan would require water quality monitoring to quantify any measurable environmental impacts due to the flow rate and water quality discharged to the Clark Fork River. The Aquatics and Fisheries Monitoring Plan would require aquatic macroinvertebrate, periphyton, and fish tissue monitoring to determine if water quality related impacts are occurring.

Catastrophic Failure: Catastrophic failure of the contingency tailings impoundment or paste facility would have significant and long term impacts to aquatic organisms downstream of the project (MDEQ and USDA 2001). Tailings impoundments and stormwater retention ponds can be exceeded and cause failure of the facilities located near the lower portion of Rock Creek (see Figure 1, page 3). This would result in release of tailings slurry, paste material, or untreated storm water runoff from the tailings paste facility and potential delivery to lower Rock Creek and the Clark Fork River downstream to Cabinet Gorge Dam. It is difficult to estimate or predict the probability, magnitude, or long term effects of such events; however, the impacts would likely be significant to proposed bull trout critical habitat.

The agencies would institute a process to review and evaluate Sterling's final tailings facility design to ensure long-term stability and minimize the probability of failure. The proposed Alternative V paste facility eliminates the type of catastrophic failure potential associated with tailings ponds. In addition, environmental consequences due to transport of material as a result of damage to the facility is essentially negligible due to the dewatered state of the paste. Inherent in the design of the placement of dewatered paste is the tendency for the material to be contained and able to be graded or re-worked if slumping or fracturing occurred. Even if there was a mass failure of the paste facility, the relatively high viscosity of the paste would be sufficient to retard flow over any appreciable distance. Conditions which could change the character, and hence the behavior of the paste tailings include a change in moisture content of the paste. However, there would need to be a significant increase in moisture content throughout the entire paste deposit before overall stability would be compromised. This increase in moisture would not be expected with the strict quality control program that would be implemented by the Agencies (MDEQ and USDA 2001).

The Failure Modes and Effects Analysis (FMEA) looked at a complete failure of the paste facility nonetheless. The likelihood of failure of the paste pile with underdrains under seismic loading for the Bottom-Up design was assigned a likelihood of occurrence of 1 in 10,000 to 1 in 1,000,000; the likelihood of occurrence for the Top-Down approach was estimated at a 1 in a 100 chance to 1 in 10,000 chance. The consequences associated with a failure in both instances were designated as "high" to "extreme," which are defined as "short-term irreversible impact, long-term excursion of water quality," and "catastrophic event, long term impact" respectively (MDEQ and USDA 2001).

Despite the estimated consequences associated with such an occurrence, there are several mitigating measures which could be implemented to reduce this risk of a failure. These include--employ the Bottom-Up construction sequence, install blanket and finger drains beneath the paste facility; continually model and monitor the moisture content of the paste pile during operations to better understand saturation levels, generate a detailed design of the paste plant operations and disposal system to ensure quality assurance and quality control during operation and post-closure. With these compensating factors fully employed, the FMEA analysis estimated the likelihood of failure under the Bottom-Up option as "negligible" (< 1 in 1,000,000 chance of occurring), and the confidence associated with this estimate was considered "high" (MDEQ and USDA 2001).

Direct and indirect effects are likely to occur if a pipeline rupture or vehicle accident results in slurry or hazardous substances entering Rock Creek (USDA 1999). The slurry pipeline, water reclaim line, or discharge pipeline could leak or break, potentially spilling its contents to Rock Creek and possibly the Clark Fork River depending on Rock Creek flow levels. Trucks carrying reagents or concentrate also are at risk of accidents and spill to bull trout habitat. Pipeline ruptures or vehicle accidents could occur anywhere from the uppermost portion of West Fork Rock Creek downstream to the mouth of Rock Creek, but not in the East Fork Rock Creek portion of the drainage (Figure 2). Although time, location, and extent of these events are unpredictable, such events have occurred at ASARCO's nearby Troy mine in 1984 and could occur during the life of the Rock Creek mine (MDEQ and USDA 2001). Factors adding to the risks associated with spills include frequency and number of trucks hauling, weather, proximity of the road to live water, effectiveness of spill response equipment, and frequency and thoroughness of maintenance of facilities. In addition to direct effects on fish, such events may result in chronic and long term effects on the habitat's ability to support bull trout. Monitoring and mitigation plans are expected to address the necessary requirements to minimize impacts in the event of a spill.

Emergency Action Plans would be required prior to mine operation to facilitate monitoring and mitigation in the event of accidental discharge of toxic or hazardous materials or sediments which could adversely impact the environment. The Acid Rock Drainage and Metals Leaching and Water Resources Monitoring Plans would require testing and monitoring of the paste tailings to determine tailings and tailings impoundment facilities impacts to surface and ground water.

Water Temperature and Groundwater Influence: As part of this project, right-of-way clearing within the riparian area is expected to facilitate road, powerline and pipeline construction and maintenance. Previous logging activities have already reduced existing shading to the stream, and these activities are expected to add to that cumulative loss (USDA 1999). Additional loss of riparian vegetation may affect stream temperatures within Rock Creek and aggravate existing habitat complexity conditions.

The loss of groundwater to interception by the mining activities also is expected to influence stream temperatures in Rock Creek (USDA 1999). The loss of groundwater recharge and upwellings resulting from the removal and discharge of between 1,700 and 2,046 gpm during mining operations is expected for the life of the mining operations and possibly after mine closure. Impacts to seeps and wetlands in the area are expected to adversely affect groundwater flows. The groundwater provides a cooling effect and is important to maintaining colder stream temperatures essential for high quality spawning and rearing habitat. Groundwater upwelling is important to the success of spawning and successful incubation of eggs to larval stage (Baxter and Hauer 2000). Groundwater flow loss could reduce Rock Creek discharge potentially reducing base flows, reducing habitat complexity, and exacerbating the physical barrier to fish passage in lower Rock Creek. The loss of groundwater and the effect to proposed bull trout critical habitat are difficult to predict and monitoring is proposed to detect any mining induced changes in groundwater components of the water quantity and chemistry budgets in Rock Creek.

The threat to overlying lakes and streams is associated with groundwater drainage stress. Cliff Lake and Moran Basin receive much of their inflow from groundwater and subsequently recharge the groundwater system down gradient (Gurrieri 2001). Because the underlying rock is highly fractured, mine dewatering during operation may reduce groundwater input to the lakes and subsequent output from the lakes. This may reduce baseflows in streams receiving groundwater down gradient of the lakes. The risk of groundwater drainage stress is listed moderate for Cliff Lake and Moran Basin. To reduce risk of groundwater drainage stress, a buffer zone of 1,000 feet around Cliff Lake would be maintained. In addition, monitoring subsurface hydraulic conditions would allow early detection of potential mining impacts and grouting of groundwater inflows to the mine. The Corrective Action Plan would identify measures to be taken should monitoring identify potential water resources issues. Hydrogeologic information collected during evaluation adit construction would be used to develop these measures and evaluate their effectiveness (MDEQ and USDA 2001).

Buffer zones are assumed effective in reducing the impact to overlying lakes and down gradient streams, but mine related effects to groundwater flow and chemistry are very difficult to predict reliably. The case studies of other mines presented by Gurrieri (2001) provide evidence of the unpredictable nature of groundwater flow in fractured rocks. In this instance, the Troy mine serves as a close analog to predict impacts from mining because of its similar location, climate, geology, and structure (Gurrieri 2001). Disruptions of surrounding surface water bodies has not been documented, but no lakes or perennial streams directly overly the Troy mine and intensive monitoring has not been conducted. Gurrieri (2001) concludes the likelihood of impact would be reduced to low for both lakes given proposed mitigation.

An additional risk to down gradient streams is post-closure leakage of groundwater containing dissolved metals from the mine to the surface. After mine closure, groundwater from the mine could leak through rock fractures down gradient to the surface and into streams. Because of high risk of impact to North Basin and South Basin Creeks, 1,000-foot buffer zones near ore outcrops and post-closure mine dewatering would be maintained for these down gradient streams. Such mitigation would reduce the likelihood of impact to low (Gurrieri 2001).

The only certain mitigation to avoid post-closure leakage of dissolved metals to the surface is mine dewatering after closure. However, this would have to be done in perpetuity, and mine dewatering after closure would maintain the groundwater drainage stress on overlying lakes and streams since dewatering and adit plugging are mutually exclusive. If the mine is left to passively drain from the adit, the mine would flood to the level of the adit and possibly discharge to the North Basin and Copper Gulch, tributaries to the Bull River system. Again, 1,000-foot buffer zones near ore outcrops and post-closure mine dewatering would be maintained for these down gradient streams. Such mitigation would reduce the likelihood of impact to low (Gurrieri 2001).

<u>Substrate Composition and Fine Sediment</u>: The most obvious direct impact of the construction and operation of the Rock Creek Mine to bull trout is the increased level of fine sediments entering the stream during the construction phase. Activities associated with the development of the mine include road construction, road reconstruction, bridge and culvert replacement, alteration of existing roads to conform to Best Management Practices Standards (BMPS), construction and development of tailings ponds, adit and mill sites, powerlines, and pipelines.

Sediment loading is predicted to increase above existing conditions, 46 percent in the West Fork of Rock Creek, 20 percent in the East Fork of Rock Creek, and 38 percent overall for the entire Rock Creek watershed (USDA 1999). The highest levels of sediment are expected to occur during the 5-year construction period with decreasing levels of additional sediment entering the stream during the 35-year operating life of the mine. Fine sediment levels in Rock Creek spawning gravels are already at numbers that reduce bull trout survival. Increased sediment levels in spawning gravels are known to lower the survival of salmonid eggs to the emergence stage (Weaver and Fraley 1993). Increases in sediment levels to certain thresholds (more than 30 percent of materials less than 6.4 mm) results in embeddedness associated with sharp declines in juvenile bull trout densities (Shepard et al 1984). Very little spawning habitat is available in Rock Creek, and spawning habitat currently contains high levels of sediment. Any increase in sediment deposition is a risk to bull trout habitat productivity and bull trout survival rate.

Sedimentation increases embeddedness and results in decreased aquatic insect production and diversity. Juvenile bull trout feed primarily on aquatic macroinvertebrates and the distribution of aquatic macroinvertebrates inhabiting running water environments is highly dependent on substrate particle size (Cummins and Lauf 1969). Increased levels of deposited sediment reduce the quantity of the food base for bull trout resulting in slower growth rates, higher mortality, and reduced fecundity of bull trout.

An indirect effect of the proposed action relates to impacts of increased levels of sediment on stream habitat characteristics and the effects of those impacts on bull trout and prey availability. Such indirect effects may include changes in stream channel morphology and decreased availability and quality of interstitial spaces affecting rearing habitat, resulting in lower juvenile survival. Any habitat changes may be aggravated by a decreased availability of water supply to the stream caused by disruption of ground water and surface drainage patterns as well as direct withdrawal of water.

The Aquatics and Fisheries Monitoring Plan would require fine sediment monitoring to determine if BMPS and other mitigation are effective or if impacts to aquatic resources are occurring.

Nonnative Species: Additional risks related to the mine would further compromise the continued existence of Rock Creek bull trout. For example, changes in habitat conditions also are expected to favor non-native brook trout. In the western United States, where brook trout have been introduced into bull trout habitat, habitat degradation generally favors brook trout, thus yielding a competitive edge over bull trout (Rieman and McIntyre 1993). Brook trout interbreed with bull trout, offspring are most often sterile; however, there has been some evidence of F2 hybrids in other drainages, an indication of successful breeding of hybrid offspring (Hansen 2001).

Proposed Critical Habitat Response to the Proposed Action

The expected proposed bull trout critical habitat response to the ongoing mining operations is associated with impacts to the aquatic habitat and the resulting impacts to individual bull trout. Increased sediment from the proposed mining activities has potential to impact the habitat's ability to support several life stages of bull trout within the action area during the proposed project. Increases in sedimentation affect incubation, emergence, and survival rates of eggs, fry, and juveniles. Fine sediment fills spaces between the gravel needed by incubating eggs and fry. Because bull trout eggs incubate about 7 months in the gravel, they are especially vulnerable to fine sediment and water quality degradation (Fraley and Shepard 1989). Rearing habitat is similarly affected, as juveniles also live on or within the streambed cobble (Pratt 1984).

Given the existing degraded conditions of the watersheds, increases in sedimentation, decreased base flow, and changes in channel and habitat complexity as a result of the proposed project are expected to adversely affect proposed bull trout critical habitat in Rock Creek. Increases in sediment and changes in habitat complexity are considered more than insignificant or inconsequential. Those activities would affect aquatic habitat as well as the associated life stages of bull trout in the Rock Creek watershed. Long-term impacts associated with groundwater development, metals contamination, and catastrophic events also are inherent to a proposal of this magnitude and considered risks to bull trout and proposed bull trout critical habitat.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local or private actions reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The primary risk to bull trout in the action area is fragmentation of the historic migratory populations caused by mainstem hydroelectric dams. Private forestry practices and mining activities have further degraded existing habitat and are expected to continue. Other risks include environmental instability from landslides and rain on snow events, illegal harvest, introduced species, thermal barriers, and rural and residential development (MBTSG 1996b).

Dams affecting the lower Clark Fork River watershed eliminate bull trout migration into the action area and fragment migratory corridors between fluvial and resident bull trout. Residential development along stream corridors could lead to stream channel alterations exacerbating water temperature, nutrient, and bank stability problems. Private and DNRC salvage harvest and associated road construction reduce potential woody debris contributions, increase sediment, and increase summer stream temperatures.

Cooperative efforts between Avista, Montana Fish Wildlife and Parks, and local watershed groups providing long-term habitat protection through land acquisition, conservation easements, and watershed restoration are likely to continue. Such activities in the Bull River drainage, although not in the action area of this project, could increase bull trout occurrence in the Cabinet Gorge Reservoir subpopulation.

Cumulative Effects to Proposed Critical Habitat

Cumulative effects include the effects of future State, tribal, local or private actions reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The primary risk to proposed bull trout critical habitat in the action area is fragmentation of the historic migratory corridors by mainstem hydroelectric dams. Private forestry practices and mining activities have further degraded proposed critical habitat and are expected to continue. Other risks include environmental instability from landslides and rain on snow events, illegal harvest, thermal barriers, and rural and residential development (MBTSG 1996b).

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Cooperative efforts between Avista, Montana Fish, Wildlife and Parks, and local watershed groups providing long-term habitat protection through land acquisition, conservation easements, and watershed restoration are likely to continue. Such activities in the Bull River drainage, although not in the action area of this project, could increase bull trout occurrence in the Cabinet Gorge Reservoir subpopulation.

CONCLUSION

Jeopardy Analysis of Columbia Basin Distinct Population Segment

After reviewing the current status of the Columbia Basin DPS of bull trout, the environmental baseline for the action area, the effects of the proposed mining operations, and the cumulative effects, it is the Service's biological opinion the actions as proposed, are not likely to jeopardize the continued existence of the Columbia Basin DPS of bull trout, as listed. This conclusion is based on the magnitude of the project effects in relation to the listed population at the Columbia River basin scale. Implementing regulations for section 7 (50 CFR 402) defines "jeopardize the continued existence of" as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species."

As proposed, implementation of the Rock Creek mine is anticipated to adversely impact the majority of occupied habitat in the West Fork and mainstem of Rock Creek and to a lesser extent habitat in the East Fork Rock Creek. Activities in the action area associated with the proposed mining operation would likely result in some mortality related to expected degradation of aquatic habitat including spawning habitat, rearing habitat, and food supply and the related risk to all bull trout life history stages. Increases in sedimentation, water quality degradation, and changes in channel and habitat complexity related to mining activities are anticipated to result in reduced egg, larval, and juvenile life history stages by impairing feeding, breeding and sheltering patterns of adult and juvenile bull trout. Implementation of Alternative V may reduce the reproduction, numbers, or distribution of bull trout within Rock Creek to the degree that bull trout persistence in Rock Creek is appreciably reduced.

The Cabinet Gorge Reservoir bull trout subpopulation consists of bull trout in the reservoir, Bull River, and Rock Creek. Rock Creek bull trout are mainly non migratory, resident fish, so they are essentially isolated from Bull River bull trout. As such, Rock Creek bull trout contribute relatively little to the Cabinet Gorge Reservoir subpopulation. A modest portion of this subpopulation would be negatively impacted by proposed project actions. Anticipated impacts to bull trout are unlikely outside of the Rock Creek drainage. No activity is proposed in the Bull River drainage, the principal contributor of the subpopulation. In the event of extirpation of Rock Creek bull trout, Bull River fish would remain and constitute the Cabinet Gorge Reservoir bull trout subpopulation. However, extirpation of one of only two occupied drainages in the subpopulation would likely reduce subpopulation resiliency and increase the risk of subpopulation extirpation due to environmental stochasticity (Rieman and McIntyre 1993).

If this subpopulation were extirpated, the probability of bull trout persistence in the Clark Fork River subbasin would likely be reduced only marginally, and the probability of the persistence of the Columbia River Basin DPS would not likely be appreciably affected.

- Clark Fork River subbasin consists of major river drainages including the Blackfoot, Clark Fork, Swan, Flathead, and Bitterroot Rivers.

- Bull trout populations are considered strong in Rock Creek, of the upper Clark Fork River, (not the stream in this project's action area) and the South Fork Flathead, Blackfoot, and Swan Rivers (USDI 1998c; Figure B1).

- Trends in abundance of bull trout are stable in South Fork Flathead River, and increasing in the Blackfoot and Swan Rivers.

- The Cabinet Gorge Reservoir subpopulation contains only 66 of approximately 8,000 miles of potentially occupied bull trout habitat in the Clark Fork River watershed (W. Fredenberg, pers. comm., 2002).

- As such, this subpopulation of bull trout contains a relatively minor portion of the bull trout abundance, reproduction, and distribution in the Clark Fork River subbasin.

- This small portion of bull trout range is isolated from upstream and downstream areas by dams.

- The probability of persistence of bull trout in the Clark Fork River subbasin would not be significantly reduced even if the Cabinet Gorge Reservoir bull trout subpopulation was extirpated.

- The Clark Fork River watershed is only 1 of at least 20 major watersheds forming the Columbia River basin DPS, though it is amongst the largest (USDI 1998b).

- This demonstrates the small fraction of bull trout abundance, reproduction, and distribution of the Columbia River basin bull trout DPS represented by this subpopulation.

- The probability of persistence of bull trout in the Columbia River basin bull trout DPS would not be significantly reduced even if the Cabinet Gorge Reservoir bull trout subpopulation was extirpated.

Based on the magnitude of the project effects in relation to the listed DPS at the Columbia River basin scale the action is not likely to jeopardize the Columbia River basin bull trout DPS.

Conclusion for Proposed Critical Habitat

<u>Adverse Modification of Proposed Bull Trout Critical Habitat Analysis</u>

After reviewing the current status of the Columbia Basin DPS of bull trout, the environmental baseline for the action area, the effects of the proposed mining operations, and the cumulative effects, it is the Service's conference opinion the actions as proposed, are not likely to destroy or adversely modify the proposed Columbia Basin DPS of bull trout critical habitat. This conclusion is based on the magnitude of the project effects in relation to the proposed critical habitat at the Columbia River basin scale. Implementing regulations for section 7 (50 CFR 402) defines "destruction or adverse modification" as "a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical."

As proposed, implementation of the Rock Creek mine is anticipated to adversely impact the majority of occupied habitat in the West Fork and mainstem of Rock Creek and to a lesser extent habitat in the East Fork Rock Creek. Activities in the action area associated with the proposed mining operation would likely degrade aquatic habitat including spawning habitat, rearing habitat, and food supply and impact all bull trout life history stages. Increases in sedimentation, water quality degradation, and changes in channel and habitat complexity related to mining activities are anticipated to reduce the capability of the habitat to support feeding, breeding and sheltering patterns of adult and juvenile bull trout. Implementation of Alternative V may reduce habitat quality and the reproduction, numbers, or distribution of bull trout within Rock Creek to the degree that bull trout persistence in Rock Creek is appreciably reduced.

The Cabinet Gorge Reservoir bull trout subpopulation consists of bull trout in the reservoir, Bull River, and Rock Creek. Rock Creek bull trout are mainly non migratory, resident fish, so they are essentially isolated from Bull River bull trout. As such, Rock Creek bull trout contribute relatively little to the Cabinet Gorge Reservoir subpopulation. A modest portion of this subpopulation would be negatively impacted by proposed project actions. Anticipated impacts to proposed bull trout critical habitat are unlikely outside of the Rock Creek drainage. No activity is proposed in the Bull River drainage, the principal contributor of the subpopulation. In the event of extirpation of Rock Creek bull trout, Bull River fish and proposed critical habitat would remain and constitute the Cabinet Gorge Reservoir bull trout subpopulation. However, extirpation of one of only two occupied drainages in the subpopulation would likely reduce subpopulation resiliency and increase the risk of subpopulation extirpation due to environmental stochasticity (Rieman and McIntyre 1993).

If the value of proposed critical habitat is diminished to the extent that this subpopulation were extirpated, the probability of bull trout persistence in the Clark Fork River subbasin would likely be reduced only marginally, and the overall abundance and quality of proposed critical habitat for the Columbia River Basin DPS would not likely be appreciably affected.

- Clark Fork River subbasin consists of major river drainages including the Blackfoot, Clark Fork, Swan, Flathead, and Bitterroot Rivers.

- Bull trout populations are considered strong in Rock Creek, of the upper Clark Fork River, (not the stream in this project's action area) and the South Fork Flathead, Blackfoot, and Swan Rivers (USDI 1998c; Figure B1).

- Trends in abundance of bull trout are stable in South Fork Flathead River, and increasing in the Blackfoot and Swan Rivers.

- The Cabinet Gorge Reservoir subpopulation contains only 66 of approximately 8,000 miles of potentially occupied bull trout habitat in the Clark Fork River watershed (W. Fredenberg, pers. comm., 2002).

- The Cabinet Gorge Reservoir subpopulation contains 47.2 miles of stream and 3,200 acres of a total of 312 miles of stream and 12,014 acres of lake surface area proposed for designation as critical habitat for bull trout in this CHSU, 1 of 12 CHSUs in the Clark Fork River subbasin.

- As such, the value of proposed critical habitat occupied by this bull trout subpopulation is relatively minor compared to the proposed critical habitat distribution in the Clark Fork River subbasin.

- This small portion of bull trout range is isolated from upstream and downstream areas by dams.

- The probability of persistence of bull trout in the Clark Fork River subbasin would not be significantly reduced even if the Cabinet Gorge Reservoir bull trout subpopulation was extirpated due to diminished value of proposed critical habitat in the Rock Creek watershed.

- The Clark Fork River watershed is only 1 of at least 20 major watersheds forming the Columbia River basin DPS, though it is amongst the largest (USDI 1998b).

- The Cabinet Gorge Reservoir subpopulation contains 47.2 miles of stream and 3,200 acres of a total of 18,175 miles of stream and 498,782 acres of lake surface area proposed for designation as critical habitat for bull trout in the Columbia River basin DPS.

- The probability of persistence of bull trout in the Columbia River basin DPS would not be significantly reduced even if the Cabinet Gorge Reservoir bull trout subpopulation was extirpated due to diminished value of proposed critical habitat in the Rock Creek watershed.

This demonstrates the small fraction of proposed critical habitat distribution of the Columbia River basin bull trout DPS occupied by this subpopulation. Based on the magnitude of the project effects in relation to the listed DPS at the Columbia River basin scale the action is not likely to destroy or adversely modify proposed critical habitat of the Columbia River basin bull trout DPS.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Proposed Mining Plan of Operations in Lower Clark Fork River Basin-Rock Creek Mine

The proposed action includes the future refinement and approval of monitoring and mitigation plans for bull trout by the Sterling Mining Company, in cooperation with the MDEQ, the Forest, and the Service. Appendix K of the FEIS contains a complete description of the conceptual monitoring and mitigation plans for Alternatives III through V developed by MDEQ and the Forest.

Sterling Mining Company would develop final monitoring and mitigation plans prior to project startup. The regulatory agencies would review and approve the plans as an interagency team. To minimize impacts to bull trout, the plans potentially directly affecting the fishery would be reviewed from a fisheries perspective. The Service would participate as needed and will require the Forest fishery biologist, hydrologist, geologist, and soil scientist would be involved in issues related to water use, fishery monitoring plans, sediment abatement plans and monitoring, and groundwater. All plans would need to identify trigger or alert levels, which would require Sterling Mining Company to implement a corrective action plan. Corrective action plans for the most likely scenarios need to be developed and approved by the interagency team prior to project startup.

All monitoring would require an annual report unless otherwise specified. The reporting format and requirements would be reviewed and finalized by MDEQ, the Forest, and the Service. Reports would be submitted to other review agencies as identified by the Forest and MDEQ. After submittal of a monitoring report, the regulatory agencies and all other relevant agencies would review the monitoring plan and results, and evaluate possible modifications to the plan or permitted operations.

Monitoring and mitigation plans to be refined, approved and ultimately included in the plan of operations include:

Air Quality Monitoring
Rock Mechanics Monitoring
Acid Rock Drainage and Metals Leaching Plan
Evaluation Adit Data Evaluation Plan
Tailings Paste Facility and Tailings Surry Line Construction Monitoring Plan
Soils and Erosion Control Plan
Reclamation Monitoring Plan
Water Resources Monitoring Plan
Influent and Effluent Monitoring Plan
Monitoring of Biological Oxygen Demand Plan
Wildlife Mitigation an Monitoring Plan
Threatened and Endangered Species Mitigation Plan
Aquatics and Fisheries Monitoring and Mitigation Plan
Hard Rock Mining Impact Plan
Wetlands Mitigation Plan

<u>Amount or Extent of Take Anticipated</u>

The Service anticipates activities associated with the proposed mining operation would result in some incidental take of bull trout in the form of harm, harassment or mortality related to expected degradation of aquatic habitat parameters including spawning habitat, rearing habitat and food supply and the related risk to bull trout life history stages. Increases in sedimentation, degradation of water quality, changes in channel and habitat complexity related to mining activities are anticipated to adversely affect and likely result in a take of the egg, larval and juvenile life history stages by harming or impairing feeding, breeding and sheltering patterns of adult and juvenile bull trout.

The Forest anticipates the activities with the likelihood of harm and harassment would continue for approximately 35 years, the life of the plan of operations (USDA 1999). However, mine operation could exceed that time frame and long term effects of mining operations would likely continue indefinitely after mine closure. Impacts associated with groundwater development, metals contamination, and catastrophic events also are inherent to a proposal of this magnitude and considered risks to bull trout. Such impacts are difficult to predict, but are not anticipated by the Service. These actions contribute to the overall risk to bull trout in the Cabinet Gorge Reservoir subpopulation and Reasonable and Prudent Measures must be taken to minimize take.

The amount of take expected in the Rock Creek watershed is difficult to quantify because of the wide ranging distribution of bull trout, identification and detection of dead or impaired species at the egg and larval stages is unlikely, losses may be masked by seasonal fluctuations in numbers and aquatic habitat modifications are difficult to ascribe to particular sources, especially in already degraded watersheds. In addition, the effects of management actions associated with the mining operations are largely unquantifiable in the short term and may only be measurable in the long-term effects to the species or population levels.

The Service anticipates incidental take of bull trout primarily in the form of harm and harassment at varying levels as described in the biological opinion. The Service believes incidental take of bull trout could occur because of the implementation of proposed mining activities in post-implementation years 1 through 35; however, long term effects of mining operations would likely continue indefinitely after mine closure. Incidental take is expected to occur primarily in West Fork Rock Creek and Rock Creek downstream from the West Fork confluence, approximately 9 stream miles. No incidental take is anticipated in the Bull River system; therefore, none is exempted.

To ensure protection for a species assigned take due to mining related activities, reinitiation is required if the Terms and Conditions are not adhered to or the magnitude of the mining activities exceed the scope of this opinion.

Effect of the Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to jeopardize the continued existence of the Columbia Basin DPS of bull trout, as listed.

Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measure(s) are necessary and appropriate to minimize impacts of incidental take of bull trout:

1. To better assess and quantify incidental take of bull trout, the Sterling Mining Company shall complete a watershed assessment of the Rock Creek watershed which characterizes Rock Creek bull trout, habitat conditions, and existing sediment sources in the basin. This is to be done in consultation with the Rock Creek Watershed Council, the Forest, and the Service. Incorporate, as appropriate, any additional findings into monitoring and mitigation plans.

    a. Implement a fish monitoring program to document the current status of Rock Creek bull trout and the effect of mitigation activities on Rock Creek bull trout. Define bull trout distribution, densities, age class structures, genetics, growth rates, fecundity, and status of life history forms.

    b. Implement a fish monitoring program to document the current status of brook and brown trout distribution and the effect of project activities on Rock Creek brook and brown trout. Determine feasibility of reducing risk of hybridization and interspecific competition by removing brook and brown trout from the Rock Creek drainage using accepted methodology.

    c. Implement an assessment of existing habitat conditions for bull trout. Include assessment of spawning, rearing and overwintering conditions for resident and adfluvial bull trout. Also include temperature monitoring to establish baseline conditions for bull trout.

    d. Implement a stream habitat enhancement program that improves the ability of bull trout to move throughout the year in Rock Creek and increases habitat availability and diversity for migratory and resident bull trout. Include an assessment of alternatives and designs for stream diversion to be constructed around the paste facility.

    e. Identify sediment sources currently impacting Rock Creek and plan, design, and implement sediment abatement measures to reduce sediment input to the stream <u>prior to initiation</u> of any ground disturbing activities not related to adit exploration and development. This plan should identify existing sediment sources such as culverts, road impacts, bridges, past bank stabilization efforts and utility right of way impacts. Complete a road systems analysis to define existing and future road uses and closures.

    f. Implement a sediment monitoring program to document the ongoing condition of Rock Creek and the effect of mitigation activities on sediment levels, and the actual effect of project activities and proposed mitigation actions on sediment levels in the drainage.

2. Evaluate all possible operations of the existing effluent location or relocating the effluent outfall discharge pipe to a location eliminating any potential impacts to bull trout related to project effects on migrating or holding fish moving into Rock Creek from the Clark Fork River.

3. Implement a metals monitoring program that includes monitoring levels of metal concentrations in water, sediments, macroinvertebrates, and fish tissues. This could be incorporated in several conceptual monitoring plans including, but not limited to, the Aquatics and Fisheries Monitoring and Mitigation Plan.

4. Identify key spawning areas and implement a monitoring program of changes in groundwater influence for spawning and rearing bull trout. This would be incorporated into the groundwater monitoring program.

5. Complete a risk assessment of failure related to haul routes and mine related vehicle traffic. Incorporate any additional measures identified to minimize the risk of failures and the associated impacts to bull trout.

6. Incorporate any additional measures identified to minimize the risk of failure of the paste pile or facility and the associated impacts to bull trout.

7. Implement reporting and consultation requirements as outlined in the following terms and conditions.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Forest must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. The following terms and conditions are established to implement reasonable and prudent measure No. 1:

   Upon the of issuance of the letter of approval for the Rock Creek mine, the Forest would require the applicant to initiate baseline studies for use in a complete watershed assessment of Rock Creek. The Forest would require the applicant to complete and submit the watershed assessment to the Forest and Service prior to surface disturbance activity *not* related to the evaluation adit stage of the project.

   The assessment would include information to characterize Rock Creek bull trout, habitat conditions and existing sediment sources in the basin and would address the following issues for bull trout:

a. A monitoring plan to document the prevalence of Rock Creek bull trout. That monitoring plan would include studies to define bull trout distribution, densities, age class structures, genetics, and status of migratory (adfluvial) bull trout.

b. An assessment and subsequent monitoring to define the prevalence and distribution of brook and brown trout. In conjunction with Montana Fish, Wildlife and Parks, determine the feasibility of removing brook and brown trout from Rock Creek using accepted methodology. Evaluate the potential reduction of hybridization and competition risk by non native species and benefit to bull trout. If determined feasible and needed, subject to agreement with Montana Fish, Wildlife and Parks, remove brook and brown trout from the Rock Creek drainage using accepted methodology.

c. An assessment of current habitat conditions for bull trout. The assessment would include information on quantity and quality of spawning, rearing and overwintering conditions for resident and adfluvial bull trout.

d. An assessment of possible sediment mitigation and reduction projects within the Rock Creek basin as outlined in the proposed action. Recommendations of stream enhancement projects should be included in that assessment.

e. A feasibility assessment (including engineering options, conceptual designs, estimated costs and expected sediment load effects) for sediment abatement measures that would reduce sediment levels in the Rock Creek drainage. This assessment would include any designs for the proposed stream diversion around the proposed paste facility and a complete roads analysis and recommendations associated with mine activities and proposed mitigation projects.

   (1) The sediment abatement program shall reduce the sediment levels in Rock Creek by approximately 38 percent (the projected increase in sediment levels attributable to development of the mine as described in the BA) prior to surface disturbance activity **not** related to the evaluation adit stage of the project.

   (2) Upon completion of the feasibility assessment (1. d., above), the Forest would require the applicant to complete design and permitting requirements, in consultation with MDEQ, the Forest, and the Service, and begin construction of such sediment abatement measures as agreed to by the Forest and the Service.

f. Upon the issuance of the letter of approval for the Rock Creek Project, the Forest would require the applicant to complete and submit to the Forest and the Service a sediment monitoring plan that would adequately assess the current and long-term status of sediment levels in Rock Creek. The sediment monitoring plan would be developed in consultation with MDEQ, the Forest and the Service and would address the entire Forest permit time period. This also would include a complete assessment of the effectiveness of the sediment abatement program in the Rock Creek drainage. If the assessment concludes, and the Service agrees, that the sediment abatement program failed to substantially reduce sediment levels in Rock Creek, then the applicant would prepare an assessment of other measures that could be implemented in the Rock Creek drainage and would be completed in a time frame agreed to by the Service.

2. The following terms and conditions are established to implement reasonable and prudent measure # 2:

   a. Prior to surface disturbance activity **not** related to the evaluation adit stage of the project, the Forest would require the applicant to complete, and submit to the Forest and the Service, an evaluation of operational options with existing diffuser location and alternative locations for siting the diffuser entering the Clark Fork River below Noxon Dam. The evaluation would be prepared in consultation with the Forest, MDEQ, and the Service and would focus on recommendations that would minimize potential effects on migrating or resident bull trout utilizing the Clark Fork River habitats adjacent to the mouth of Rock Creek and the spring area immediately upstream. The Service would have the authority to ultimately approve the evaluation.

   b. If the evaluation identifies a more appropriate operation or location for the diffuser (2. a., above), the Forest would require the applicant to modify the plan of operations, as agreeable to the Service, to incorporate the alternative most likely to minimize impacts to bull trout.

3. The following terms and conditions are established to implement reasonable and prudent measure #3:

   a. Prior to surface disturbance activity *not* related to the evaluation adit stage of the project, the applicant shall submit a plan to the Forest and the Service for metals monitoring as it relates to bull trout habitat requirements that includes monitoring in water samples, sediment samples, and fish samples. This monitoring would start prior to mine development to establish the baseline, and continue during operations and post operations as determined necessary by the Forest and the Service. The Service would have the authority to ultimately approve the plan.

4. The following terms and conditions are established to implement reasonable and prudent measure #4:

   a. Prior to surface disturbance activity **not** related to the evaluation adit stage of the project, the Forest shall require the applicant to submit a plan to the Forest and the Service for monitoring of groundwater effects as they relate to bull trout habitat requirements. This monitoring would start prior to mine development to assess the baseline, and continue during operations and post operations as determined necessary by the Forest and the Service. The Service would have the authority to ultimately approve the plan.

5. The following terms and conditions are established to implement reasonable and prudent measure #5:

   a. Prior to surface disturbance activity *not* related to the evaluation adit stage of the project, the Forest shall require the applicant to submit a risk assessment of accidents related to haul routes for mine related vehicle traffic to the Forest and the Service for evaluation. The assessment would determine areas most at risk for bull trout and make recommendations for additional measures and responses to minimize risk. If any additional measures can be incorporated to minimize the risk of catastrophic failures, the Forest, MDEQ, and the Service would determine the timeline and mechanism for implementation of those identified measures.

6. The following terms and conditions are established to implement reasonable and prudent measure # 6:

   a. Minimization of paste pile or facility failures includes--employing the Bottom-Up construction sequence, installing blanket and finger drains beneath the paste facility; continually modeling and monitoring the moisture content of the paste pile during operations to better understand saturation levels, generating a detailed design of the paste plant operations and disposal system to ensure quality assurance and quality control during operation and post-closure. If any additional measures can be incorporated to minimize the risk of catastrophic paste pile or facility failures, the Forest, MDEQ, and the Service would determine the timeline and mechanism for implementation of those identified measures.

7. The following terms and conditions are established to implement reasonable and prudent measure # 7:

   a. The Forest would require the applicant to annually prepare and submit to the Service a report of the mining year activities as well as the next year's proposed activities.

   b. Upon locating dead or injured bull trout or upon observing destruction of redds, notification must be made within 24 hours to the Montana Field Office at 406-449-5225. Record information relative to the date, time, and location of dead or injured bull trout when found, and possible cause of injury or death of each fish and provide this information to the Service.

c. During project development and operation the Forest or applicant shall notify the Service within 24 hours of any emergency or unanticipated situations arising that may be detrimental for bull trout relative to the proposed activity.

d. Within 90 days of the end of each year, the Forest or applicant would provide a written report or letter to the Service indicating the actual number of bull trout taken, if any, as well as any relevant biological/habitat data or other pertinent information on bull trout that was collected.

e. The Forest shall assure consistent implementation of measures and standards specified in the Aquatic Conservation strategies as indicated in the 1998 Biological Opinion for the Effects to Bull Trout from the Continued Implementation of Land and Resource Management Plans and Resource Management Plans as Amended by the Interim Strategies for Managing Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, Western Montana, and portions of Nevada (INFISH), and the Interim Strategy for Managing Anadromous Fish-producing Watershed in Eastern Oregon and Washington, Idaho and portions of California (PACFISH).

f. To better monitor mitigation measures identified, the Forest would provide summaries to the Service of all INFISH compliance, water quality and fish population monitoring conducted in conjunction with these mining operations.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. With implementation of these measures, the Service expects that take of bull trout would be a result of the impacts to instream habitat associated with increases in sediment, modifications to water quality, and modifications of instream habitat conditions for the life of the mining operations and reclamation activities. Some long term effects of mining operations would likely continue indefinitely after mine closure. If, during the course of the action, the project descriptions are not adhered to, the level of incidental take anticipated in the biological opinion may be exceeded. Such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Service retains the discretion to determine whether non-compliance with terms and conditions results in take exceeding that considered here, and whether consultation should be re-initiated. This may require suspension of mining operations. The Federal agency must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. The Service recognizes the impacts of past mining, roading and logging actions on watersheds on the Forest. For the benefit of the watershed and listed bull trout, the Service encourages the Forest to seek funding to reclaim and restore impacts from previous actions.

2. The Service recognizes and appreciates the Forest and Sterling Mining Company's involvement with the Rock Creek Watershed Council. We encourage continued participation and development of actions to further restore native fish populations in the Rock Creek drainage.

3. To progress toward bull trout recovery in the Clark Fork Recovery Unit, the Service encourages the Forest to consider incorporating recommended recovery tasks of the bull trout draft recovery plan (USDI 2002b).

4. In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

Reinitiation and Closing Statement

This concludes formal consultation and conference on the actions outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if--(1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

You may ask the Service to confirm the conference opinion as a biological opinion issued through formal consultation if the critical habitat is designated. The request must be in writing. If the Service reviews the proposed action and finds that there have been no significant changes in the action as planned or in the information used during the conference, the Service will confirm the conference opinion as the biological opinion on the project and no further section 7 consultation will be necessary.

After designation of critical habitat for bull trout and any subsequent adoption of this conference opinion, the Federal agency shall request reinitiation of consultation if--(1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect the species or critical habitat in a manner or to an extent not considered in this conference opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the species or critical habitat that was not considered in this conference opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

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